

# **Network Organization Pitfalls and Success Factors for Team and Organizational Processes**

**Analyses of Key Organizational Variables and Cultural Differences in International  
Military Contexts**

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## **Abstract**

This dissertation investigates effects of network organization in military organizations. The last decades' changes in the tasks and responsibilities of military organizations have prompted a need for organizational change. Military theorists have fronted network organization as the solution, thus making military teams and organizations both currently relevant and appropriate cases for the focus of this research. Network organization would imply changes to central organizational variables, like structure and processes, as well as increased ad hoc distributed and multinational collaboration. The presented research explores issues related to the effects of such changes on flexibility, effectiveness, trust, and team processes, as well as on issues related to culture and the measurement of individualism/collectivism in military samples. To this end, data were collected through an experimental series and at three different multinational military exercises. The experimental series was conducted in a lab environment using a web-based gaming tool adapted for the study of distributed team collaboration. This technique represents a new approach to studying international team-work and collaboration, cultural differences, and trust. Methods of direct observation, observer ratings, and self-report questionnaires were employed. The results from this work have been reported in four articles, which are cited in the second half of this dissertation.

The first article (I) investigates organizational structure and processes as antecedents of organizational flexibility in military contexts, and also explores possible moderator effects of power distance and cultural diversity. To this end, both self-report and experimental data were collected from three military exercise organizations and one series of laboratory experiments. The data from each of these studies were analyzed both separately and collapsed across studies. When all data were analyzed together, significant relations between decentralized processes and flexibility and between flat structure and flexibility were observed. No moderator effects were found. Moreover, the analyses revealed that decentralized processes were the most consistent predictor of organizational flexibility across each of the four studies.

The second article (II) furthers the research in article I and explores the consequences of flat structure, decentralizing processes, and alignment (i.e., of structure and processes) for the effectiveness (measured by information sharing, decision making, and organizational rating) of military organizations. To this end, self-report data were collected in three different military exercise organizations. The results indicated that flat structure and decentralized processes both



predict organizational effectiveness, with almost full mediation by flexibility. Because structures and processes were found to be well aligned in the organizations studied, the results could not reveal the effects of misalignment, suggesting that further research would be needed to establish this. The results reported in the two first articles imply that changes toward flatter and more decentralized organizational solutions may yield both more flexibility and more efficient organizational processes.

The consequences of multinational distributed ad hoc team collaboration are examined in article III. Moreover, this article explores trust as a mediator, explaining how cultural diversity may affect team processes and outcomes in distributed ad hoc teams. To this end, data were collected through both self-report and direct behavioral measures from a series of laboratory experiments. The results demonstrated significantly lower trust in culturally heterogeneous teams than in homogenous teams, which confirms earlier research that found that diversity can make it more difficult to build trust. In turn, trust was found to be positively related to team processes (i.e., communication), whilst performance was not significantly predicted. The results suggested that trust will add explanatory value as a mediator in future team composition research and further implied that multinational ad hoc distributed teams may not be optimal, indicating a need for the allocation of time to build trust in culturally diverse teams.

Article IV focuses on the cultural dimension of individualism/collectivism (I/C). This dimension may indicate differences in the potential for increased collaboration, as described in network organization theories. The article examines whether Hofstede's Values Survey Module VSM-94 survey tool can be gainfully employed to measure I/C in an international military sample, namely, by predicting I/C-type behavior in national and multinational teams. An experimental design was adopted, employing both self-report and direct behavioral measures and including participants from five countries. The results did not reveal any systematic differences between individualists and collectivists in culturally diverse contexts. The results further indicated that the VSM-94 did not predict I/C behaviors in the military sample. However, the I/C behaviors were better predicted by the scores from Hofstede's original research, suggesting that the between-country differences in I/C are no different in military than in civilian populations. These results contradict previous interpretations of I/C measurements using the VSM in military samples, where the opinion has been that military personnel have different values compared with the civilian population. Our findings instead called into question the appropriateness of the VSM

for measuring I/C in samples such as the military. The results further suggested a re-examination of other research that has proposed within-culture subgroup variability in I/C based on self-report measures only.

## List of Articles

- I. Bjørnstad, A. L., & Lichacz, F. M. J. (In press 2013). Organizational flexibility from a network organizational perspective: A study of central predictors and moderating factors in military contexts. *Leadership and Organization Development Journal*.
- II. Bjørnstad, A. L. (2011). Exploring network organization in military contexts: Effects of flatter structure and more decentralized processes. *Military Psychology*, 23 (3), 315-331.
- III. Bjørnstad, A. L., Fostervold, K. I., & Ulleberg, P. (2011). Effects of cultural diversity on trust and its consequences for team processes and outcomes in ad hoc distributed teams. *Scandinavian Journal of Organizational Psychology*, 3 (2), 3-15.
- IV. Bjørnstad, A. L., & Ulleberg, P. (submitted). A multi-method study of cultural values and behavior: Does Hofstede's individualism/collectivism measure predict team type behavior in an international military experimental setting?



## **1. Introduction**

This dissertation explores issues related to network organization. The research was conducted in international military contexts. The aim has been to research central propositions in network organizational theories, focusing on the issues of flat organizational structure and decentralized processes, ad hoc distributed teams, cultural diversity, and multinational collaboration. Effects of network organization are explored in relation to organizational flexibility, effectiveness, trust, and team processes. The research is presented in four articles that have been published or submitted for publication in international peer-reviewed journals.

### **1.1 Network Organization**

The ideas and organizational designs associated with network organization emerged in the business sector during the 1980s. Their introduction was mainly a result of market changes alongside new technology developments, with the former creating the necessity for change and the latter enabling the change (e.g., Snow, Miles, & Coleman, 1992; DeSanctis & Poole, 1997; Tiernan, Flood, & Murphy, 2002).

Common to different network organization approaches is the understanding that network organization represents a move away from traditional bureaucratic types of organizations with a hierarchical structure and centralized, stove-piped authority and decision-making processes in favor of flatter, more decentralized and flexible types of organizations (e.g., Alberts & Hayes, 2003, 2007; Arnold, Cooper, & Robertson, 1998; Atkinson & Moffat, 2005; DeSanctis & Poole, 1997; Morgan, 1997; Snow et al., 1992). According to network theory, such organizational changes will promote adaptability and effectiveness (e.g., Alberts & Hayes, 2003, 2007; Atkinson & Moffat, 2005). In addition to the changes to structures and processes, ad hoc and team-based organization is proposed by network theories as a way to cope with rapid changes in the tasks and responsibilities of organizations (e.g., Alberts & Hayes, 2007; DeSanctis & Poole, 1997). With the new technological solutions also enabling collaboration across long distances, distributed team collaboration not only is suggested in network theory but also is increasingly the reality for a wide range of organizations. Finally, the ever more globalized markets, conflicts, tasks, and challenges faced by business, government, humanitarian, and military organizations engender increased multinational collaboration, which is also a core element in network organization theory (Alberts & Hayes, 2003, 2005; Atkinson & Moffat, 2005; DeSanctis &

Poole, 1997). The success of network organization is considered to depend on trust and increased collaboration across boundaries, including national cultural boundaries (Alberts & Hayes, 2005; Atkinson & Moffat, 2005; DeSanctis & Poole, 1997), the latter referred to as collectivist dynamics by Atkinson and Moffat (2005). In sum, network theories suggest a range of organizational solutions that aim to meet the challenges of today's organizations. The aim of this thesis has been to research these propositions.

## **1.2 Research on Central Network Theory Components**

### **1.2.1 Flexibility, effectiveness, and their antecedents (flat structure and decentralization).**

It has been advocated in both organizational and network theories that organizations need to be flexible in order to meet the demands of changing and unpredictable environments (Alberts & Hayes, 2003; Atkinson & Moffat, 2005; Englehardt & Simmons, 2002; Volberda, 1998). Correspondingly, flexibility is understood as the ability of the organization to adapt and respond successfully and adaptively to the complex, unpredictable and changing demands of the environment (Hatum & Pettigrew, 2006). Although flexibility is central in network theories, it is far from being new as a goal in organizational development. Indeed, flexibility has been identified by theorists as a critical factor in organizational excellence for at least three decades (Alberts & Hayes, 2003; Atkinson & Moffat, 2005; Bahrami, 1992; Krijnen, 1979; Morgan, 1997; Overholt, 1997; Snow et al., 1992; Volberda, 1998; Zammuto & O'Connor, 1992). In network theory, flexibility is viewed as essential for achieving increased information sharing and collaboration across organizational hierarchies and departmental lines, facilitating high-quality timely decisions and responses and, in turn, enhancing efficiency. The suggestion that flexibility increases effectiveness has also been supported empirically in past research (Campion, Medsker, & Higgs 1993; Khanna & New, 2008; Patterson et al., 2005).

Volberda (1998) argues, in line with network theories (e.g., Alberts & Hayes, 2003, 2007), that flatter structures provide a foundation for flexibility. Structure (flat/hierarchical) is defined as the degree to which the organization may be understood as flat as opposed to hierarchical in terms of the number of levels in the organizational hierarchy (e.g., Volberda, 1998). When information must travel through the many levels of a hierarchical structure, the information becomes increasingly degraded with each level through which it must pass (Volberda, 1998). At

the same time, the information-sharing processes become increasingly time-consuming (Volberda, 1998). In turn, these inefficient processes will affect both the ability to make timely and appropriate decisions and the ability to take action within the time available. This problem is exacerbated when the organization faces new challenges and the hierarchy becomes overloaded with large amounts of information flowing up and down the levels before a decision can be made and any action taken. The contention that a flat structure promotes flexibility and effectiveness remains theoretical, however, because empirical testing is largely lacking.

Another central feature of network organization is the distribution of power and authority to the lower echelons of the organizational hierarchy (e.g., Alberts & Hayes, 2003, 2007; Arnold et al., 1998; Atkinson & Moffat, 2005; Morgan, 1997; Snow et al., 1992). Empowering the lower levels enables decentralized processes (e.g., Sheremata, 2000), which means shorter information-sharing and decision-making loops (e.g., Roman, 1997). Whereas structure (flat/hierarchical) is understood as the formal hierarchical structure of the organization, processes (decentralization/centralization) is understood to describe how the structure is implemented in terms of collaborative and decision-making processes (DeSanctis & Poole, 1997). Decentralization furthermore greatly increases the number of individuals who are able to make decisions, hence improving the total decision-making capacity of the organization (e.g., Alberts & Hayes, 2003; Galbraith, 2002). This line of reasoning suggests that decentralized processes enhance both the speed and the capacity of the organization to handle large numbers of simultaneous tasks in a dynamic environment that, in turn, is understood to be crucial for achieving flexibility (e.g., Alberts & Hayes, 2003; Englehardt & Simmons, 2002; Galbraith, 2002; Volberda, 1998).

Research on the relationship between decentralization and flexibility using data collected in different industries and countries and at different hierarchical levels has demonstrated equivocal findings (Hatum & Pettigrew, 2006; Liebeskind, Oliver, Zucker, & Brewer, 1996; Zammuto & Krakower, 1991). Thus, although the research of both Liebeskind et al. (1996) and Zammuto and Krakower (1991) suggested a positive relationship between decentralization and flexibility, the work of Hatum and Pettigrew (2006) indicated the opposite. The difference in findings suggests that the organizational type and context may be of some consequence. Hatum and Pettigrew (2006) suggested that research need to focus on international organizations, a focus shared also by network theories (e.g., Alberts & Hayes, 2003). Moreover, because all types

of organizations increasingly face a globalized reality, multinational environments are key contexts to understand.

Multinational environments entail multicultural collaboration. Philips and Thomas-Hunt (2007) proposed that a flatter structure increases the organization's ability to take advantage of team diversity. Moreover, flat structure and decentralized processes may contribute to the recognition of the added knowledge and viewpoints in a culturally diverse team or organization. In turn, taking advantage of group diversity may confer increased flexibility. Hence, diversity may influence flexibility positively given a flat structure and decentralized processes.

Additionally, one cultural difference may be particularly pertinent to the current research focus. Cultural differences in Power distance (Pd) influences whether people from different countries are used to and prefer to work in more hierarchic and centralized types of organizations or whether they conversely are used to and prefer to work in flatter and more decentralized types of organizations (e.g., Hofstede, 1991, 2001). Pd is defined as "the extent to which the less powerful members of institutions and organizations within a country expect and accept power to be distributed unequally" (Hofstede, 1991: p. 28). The level of Pd may thus influence the ability to function in a flat as opposed to a hierarchic structure, and with decentralized as opposed to centralized processes. Consequently, this cultural potential to function in different types of organizations may influence whether flat structure and decentralization can yield flexibility.

The organizational archetypes, such as bureaucratic and network organization, are commonly contrasted in both organizational and network literature (e.g., Morgan, 1998; Volberda, 1998; Alberts & Hayes, 2003). Hierarchical structures and centralized processes and, conversely, flat structures and decentralized processes are often treated as if they were the same thing (e.g., Carley & Lin, 1997; Morgan, 1997). In reality, a hierarchical structure does not necessarily signify centralized processes, and a flat structure does not necessarily signify decentralized processes; any problem arising from non-congruent designs is downplayed in this literature. Rather, as suggested by others, the alignment of core organizational variables may be central to an organization's effectiveness (Galbraith, 2002; Kotter, 1978; Lawler, 1996; Overholt, 1997; Pettigrew, Woodman, Cameron, 2001). This view means that if a fit between core organizational variables such as structure and processes is not ensured in organizational development, the organizational changes implemented could result in a deterioration of organizational functioning and, hence, a decrease rather than an increase in effectiveness. For



instance, if the structure is changed from hierarchical to flat at the same time that the decision-making authority is centralized at the top end (rather than distributed to the lower end), the decision-making load on the top management is liable to become too heavy and render the organization inefficient (i.e., unable to reach necessary decisions, particularly in critical situations and within the time available). This idea is exemplified in studies of both operational military (Vego, 2003) and health care organizations (Kvande, 2007), suggesting that a balanced development of structures and processes may be at the heart of successful organizational change. Alignment is thus understood as the congruence between the organization's structure and processes. In research, a lack of alignment between structure and processes, unless controlled for, could also represent a challenge to interpreting the effects of these variables.

### **1.2.2 Trust.**

Previous research has found trust to play an important role in a network organizational context (Mackenzie, 2008), including having a relation with decentralization (Bloom, Sadum, & Van Reenen (2009). Trust is, moreover, considered to be a required property of network organization (Alberts & Hayes, 2005; Atkinson & Moffat, 2005). Rousseau and colleagues suggested in 1998 (p. 395) a cross-disciplinary definition of trust, which has been understood in later research to include the most essential elements of trust (e.g., Burke et al., 2007; Dirks & Ferrin, 2002): "Trust is a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another".

Despite its purportedly essential role in network organization, the literature says very little about either how trust can be achieved or whether there may be some challenges associated with building trust in network organization (e.g., Alberts & Hayes, 2005; Atkinson & Moffat, 2005). In some of the literature though (Alberts and Hayes, 2005, 2007), there is an increasing awareness of the challenges pertaining to trust in multinational collaborative contexts. These authors reflect on trust as being more difficult to obtain in diverse than in homogeneous contexts, concluding in the latter publication (Alberts and Hayes, 2007) that trust is an area in need of more research. In a network context, collaboration is, in addition to being more multinational, also ad hoc and distributed, which indicates a need to understand the role of trust in these contexts. The literature on trust and team diversity suggests that ad hoc organization, distributed collaboration, and cultural diversity may all be factors leading to *less* trust (e.g., Connaughton &

Shuffler, 2007; McAllister, 1995; Oertig & Buergi, 2006; Watson, Kumar, & Michaelsen, 1993; Williams, 2001). The issue is that even though trust may be needed, ad hoc distributed culturally diverse teams<sup>1</sup> may not foster trust. However, no studies have researched the effects of ad hoc organization, distributed team collaboration, and cultural diversity for the level of trust, team processes, and output in concert. Cultural diversity is defined as national cultural differences (or heterogeneity) in the present research, in accordance with the current focus and in line with the field of cross-cultural psychology (e.g., Earley, 1989, 1997; Hofstede, 1991, 2001; Trompenaars, 1997; Triandis, 1995). Trust in a shorter time frame, which is relevant to the ad hoc context, is defined as swift trust (Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Meyerson et al., 1996). Swift trust is understood to be depersonalized and highly task- and action-related (Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Meyerson et al., 1996). This concept of trust differs from affective trust, which is developed over time. Moreover, swift trust is understood as a cognitive form of trust that is based on categorical assumptions and implicit theories more than on the actual trustee, as well as being focused on expectations of future behavior (Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Meyerson et al., 1996). Of Mayer et al.'s (1995) now classic trust factors (i.e., ability, benevolence, and integrity), Jarvenpaa et al.'s work (1998) suggests that integrity has the most impact and benevolence the least impact on trust in a shorter time frame. Furthermore, ability has been both suggested and found to be central to trust in temporary distributed teams (Lee, Bond, Russel, Tost, González, & Scarbrough, 2010; Meyerson et al., 1996; Rico et al., 2009). Hence, ability and integrity may be considered the most relevant of Mayer et al.'s (1995) trust factors in ad hoc distributed teams.

### **1.2.3 Collectivism.**

Collectivist dynamics have been suggested as a necessary quality of network organization (Atkinson & Moffat, 2005). However, even more so than with the issue of trust, network theories lack a conception of how to achieve collectivist dynamics. The term collectivist dynamics has been defined as “the cascades of local interaction that ripple through the system” (Atkinson & Moffat, 2005: p. 37). This definition obscures more than it enlightens, especially because there is no clarification of the terms “cascades of local interaction” and “system”. Atkinson and Moffat

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<sup>1</sup> In line with the often-used definitions of a team provided by, e.g., Salas et al. (2005, 1992) and Kozlowski and Ilgen (2005), a team is understood in the present research as two or more individuals working interdependently toward a common goal.

(2005) offer no further explanation of the term collectivist dynamics, let alone what its antecedents may be.

The term collectivist has a long tradition in the field of cross-cultural psychology, where collectivism describes a culture in which values and work activities are relatively more group oriented than individually oriented (e.g., Hofstede, 1991, 2001). Indeed, one of the most central aspects of cross-cultural differences that is likely to have an impact on cooperation both within and across different cultures is the cultural construct of individualism/collectivism (I/C) (e.g., Earley, 1994, 1989; Hofstede, 2001; Oyserman, Coon, & Kemmelmeier, 2002; Triandis, 1995). For the purpose of this dissertation, culture is defined as national culture. This definition concurs with the field of cross-cultural psychology (e.g., Aycan, 2000; Earley, 1994, 1989; Hofstede, 2001; House, Hanges, Javidan, Dorfman, & Gupta, 2004; Inglehart, Basáñez, Díez-Medrano, Halman, & Luijkx, 2004; Matsumoto, 2007; Oyserman, Coon, & Kemmelmeier, 2002; Schwartz & Sagiv, 1995; Triandis, 1995) as well as with the above-presented understanding of cultural diversity. Although cultures are not always equivalent to countries, this approximation (e.g., Triandis, 1995) is deemed appropriate for the scope and samples studied in the present research. In line with, e.g., Earley (1997), Hofstede (1991, 2001), and Triandis (1995), the shared values, meaning systems, and patterns of behavior that are learned from other members of a society are understood to define a culture. One may define the differences between countries as differences between societies in the average individual manifestations of the societal culture.

I/C is one of the most researched topics and most frequently employed constructs in cross-cultural psychology (Oyserman et al., 2002). Although researchers largely concur in their understandings of the concept, there has been little agreement on the methodological approaches in terms of either tools of measurement or levels of focus (for reviews, see Kirkman et al., 2006; Oyserman et al., 2002). The current focus is at the country level. I/C refers to a cultural difference in group (collectivist) as opposed to individual (individualist) orientation that influences behavior (e.g., Hofstede, 2001; Earley, 1997). Group orientation is linked to tight ties between people, whereas individual orientation is linked to loose ties between people. Relative to individualism, collectivism has been related to more frequent occurrences of team organization (e.g., Bochner & Hesketh, 1994; Hofstede, 2001; Maccoby, 1991), to greater collaborative abilities (e.g., Earley, 1994; Eby & Dobbins, 1997; Kirkman & Shapiro, 2001; Oetzel, 1998; Thomas, 1999), to more sharing of information (Hofstede, 2001; Hwang & Kim, 2007; Kirkman

& Shapiro, 2001), and to trust (Cox et al., 1991; Triandis, 1995). These research findings explain why collectivism is considered to be advantageous in a network organizational context. However, because cultural differences have been found to be relatively stable (e.g., Earley, 1997; Hofstede, 1991, 2001; Inglehart et al., 2004; Kashima, 2000; Triandis, 1995), creating collectivism is not a viable approach. Multinational collaboration, at any rate, complicates the understanding that collectivism is advantageous for collaboration. Indeed, research is equivocal in terms of whether individualists or collectivists are better at collaboration in culturally diverse contexts. Although collectivists may outperform individualists in homogeneous collaborative contexts, in terms of team collaboration, information sharing, and trust, collectivists' tendency to differentiate more between ingroup and outgroup members (Earley, 1989; Hofstede, 2001; Triandis, 1995; Veiga & Yanouzas, 1991) may lead to fewer collaborative behaviors in multinational contexts.

To investigate such issues further, there is a need to first identify existing cultural differences in I/C. Being that I/C is the most researched cultural difference to date, this suggestion may appear somewhat superfluous. However, some research has also proposed the complicating factor of subgroup variability within cultures (House et al., 2004; Marshall, 1997; Soeters, 1997). The various Global Leadership and Organizational Behavior Effectiveness (GLOBE) dimensions show how I/C values can differ depending on the societal subgroup in which they are measured (House et al., 2004), and others have found I/C to be linked to social class (e.g., Marshall, 1997). Employing Hofstede's Values Survey Module (VSM) measurement tool, Soeters (1997) concluded that military personnel have a different cultural orientation relative to their civilian counterparts in the same countries based on a comparison of his results from a military sample with former results obtained from civilian samples (Hofstede, 1991, 2001; Hoppe, 1990, 1998; Soeters, 1997). However, this research has only researched values, and this finding has not been validated using behavioral measures. This lack of behavioral data raises the question of whether, for instance, societal subgroups such as the military also express in their behavioral patterns a different culture than their civilian counterparts or whether the survey tool lacks predictive value in certain population subgroups. Resolving this question would be a first step towards comprehending the influence of I/C in network organization in such subgroups. Understanding the cultural orientation in terms of both values and behavior can help

us to predict how well a heavily collaborative-dependent organization type such as the network organization can perform in different cultures and in multinational contexts.

### **1.3 A Case in Point**

Military organizations have experienced great changes in their tasks and responsibilities in recent decades. Cold war predictability has been replaced by rapidly changing and increasingly complex tasks and environments. Officers and soldiers encounter multifaceted assignments that range from peacekeeping operations to war, from desert to urban operations, and from national operations to multinational missions. The variability in tasks and challenges, rapid changes, and increased task complexities have called for changes to traditional military organizational structures and processes, which are still typically bureaucratic, with a hierarchical structure and centralized stove-piped authority and decision-making processes (e.g., Alberts et al., 1999, 2001; Alberts & Hayes, 2003, 2007; Atkinson & Moffat, 2005; Bolia, Vidulich, Nelson, & Cook, 2003; Roberts & Smith, 2003; Vego, 2003). At the same time, technological developments in information and communication technologies have created new opportunities for collaboration and information sharing both within and between organizations, improving the possibilities for more efficient organizational structures and processes (e.g., Alberts & Hayes, 2003, 2007; Atkinson & Moffat, 2005; DeSanctis & Poole, 1997; Volberda, 1998). A military approach to network organization emerged at the end of the twentieth century, proposing solutions to the changes and new challenges in military contexts (e.g., Alberts, Garstka, & Stein, 1999; Alberts, Garstka, Hayes, & Signori, 2001; Alberts & Hayes, 2003, 2007; Atkinson & Moffat, 2005).

Military network theories have their main roots in the USA and the UK but are currently also interpreted and embraced by NATO (e.g., Bartolomasi et al., 2005; Booth et al., 2005). Similar labels have been employed by the different countries and NATO. The term Network Centric Warfare (NCW) has been employed in the USA, the term Network Enabled Capabilities (NEC) has been used in the UK (e.g., Alberts et al., 1999; Atkinson & Moffat, 2005), whereas NATO Network Enabled Capabilities (NNEC) is the term currently employed by NATO for the collective NATO approach to the development of network enabled military organizations (e.g., Bartolomasi et al., 2005; Booth, et al., 2005). Although smaller nations have not been a driving force in theory building, this fact has not impeded local interpretations like the Norwegian

Network Based Defence<sup>2</sup>. Despite some minor differences between the various approaches, the differences are not considered relevant for the scope of the present research. The focus will be on some common and central propositions made in these theories.

Many military organizations, NATO included, have been planning for both technological and organizational changes toward a network type that is considered more appropriate for present and future tasks and challenges. Technology has thus far clearly been both the driver and focus of this development (e.g., Bartolomasi et al., 2005; Burger, 2003; for a review, see Bjørnstad, 2004). This trend is not entirely unproblematic; history abounds with examples of how new technology may not only fail to produce the intended increases in effectiveness but actually lower effectiveness when implemented in isolation (e.g., Emery, 1978; Trist & Bamforth, 1951; Trist, Higgin, Murray, & Pollock, 1990; for a more in depth discussion, see Bjørnstad, 2004). Statements such as “NCW is about human and organizational behavior” in the military network literature point to other areas of focus in need of change in military organizations (Alberts et al., 1999: p. 88). Notwithstanding such statements, the military literature remains rather superficial and anecdotal regarding the human and organizational issues related to network theory.

Some of the evidence from the civilian research presented above indicated different results from different sectors (Hatum & Pettigrew, 2006; Liebeskind et al., 1996; Zammuto & Krakower, 1991), suggesting that there may be effects of organizational context on one or more of the relations proposed by network theories. The work of Merritt (2000) and Soeters (1997) on cross-cultural differences corroborates the understanding of context as a possible influence; they concluded that it is necessary to understand the occupational context, suggesting subgroup variability. However, empirical investigations of central network organizational characteristics and cross-cultural differences are especially sparse in military and other operational type contexts, such as medical, police, and crisis relief organizations. Compared with business organizations, both military and civilian operational organizations, may be understood as relatively more action-driven type organizations. Operational organizations share a common context of a faster pace and higher complexity, risk, and stakes, combined with less controllability of rapidly changing environments. Indeed, if context is an issue, results from military organizations may be more transferrable to other operational organizations, civilian and

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<sup>2</sup> "Nettverksbasert Forsvar" (NbF) in Norwegian.

military alike, than research from business organizations. Focusing on this type of organizations should hence add value in terms of expanding on the samples studied thus far in relation to network organizational issues.

In sum, the need for change in military organizations paired with the political and strategic decision by NATO and its member nations to develop their armed forces toward NNEC make the military a very timely and relevant case to study in relation to network organization issues. Due to their operational context, military organizations also represent a type of organization that may especially benefit from network organization, but which has been more rarely studied in relation to network organizational issues. Research suggesting that there may be effects of organizational context on one or more of the relations proposed by network theories combined with a lack of research from operational contexts further suggests a need to research network organization issues precisely in such contexts. Accordingly, the main goal of this dissertation is to research the propositions of network organization theories in military contexts.

#### **1.4 General Objectives**

Recent decades' changes in the tasks and responsibilities of military organizations have prompted a need for change and a fronting of network organization as the solution, making military teams and organizations both relevant and appropriate cases for the focus of this research on network organization. At the core of network organization theory is the understanding that flatter structures and more decentralized processes will yield more flexible and efficient organizations. However, these remain unconfirmed theories, especially in operational contexts such as the military. In general, there is much theory on these issues but little empiricism. Articles I and II investigate whether these theoretical considerations are empirically supported in military contexts. Trust and collectivist dynamics are considered necessary qualities of network organization (Alberts & Hayes, 2005; Atkinson & Moffat, 2005), though the literature says very little about how these qualities can be achieved and about the challenges associated with attaining these qualities in network organization. Moreover, in the work of Atkinson and Moffat (2005), these qualities are presented as inherent to network organization rather than as prerequisites for the success of network organization. Articles III and IV investigate some of the challenges associated with developing these qualities in network organization.

## 2. Presentation of Studies

### 2.1 Article Objectives

**Article I** studies (within a military context) whether a flat organizational structure and decentralized processes predict flexibility. Article I furthermore investigates whether the results of the above hypotheses pertaining to structure and processes can be reproduced across different contexts; that is, do different military organizations and contexts yield the same results? The latter proposition is concerned with the general applicability of the results; in other words, whether flat structure and decentralized processes seem to be preconditions for achieving organizational flexibility. Additionally, article I researches the possibility of moderator effects of Pd and cultural diversity on the proposed flat structure-flexibility and decentralization-flexibility links.

**Article II** expands on the research questions in article I by investigating the consequences of network organizational changes in structure and processes on organizational effectiveness. In this dissertation, effectiveness is defined in line with Kozlowski and Ilgen (2005), who suggested using key team processes that have been shown to affect organizational output as measures of effectiveness<sup>3</sup>. This article focuses on both direct and mediated effects and also includes flexibility in the equation, thus closely tying in with article I. Moreover, it is first proposed that flatter organizational structures make military organizations more efficient than do hierarchical structures. Second, it is proposed that decentralized processes make military organizations more efficient than do centralized processes. Building on the central position of flexibility in network theories and the hypotheses from article I that flat organizational structure and decentralized processes both predict flexibility, it is expected that flexibility partially mediates the relationships between structure and effectiveness and between processes and effectiveness.

Article II further proposes that improving organizational flexibility and effectiveness by flattening hierarchies and decentralizing processes is partially dependent upon the internal alignment of these variables. It is thus suggested that such alignment may both moderate the effects of flat structure and decentralized processes on flexibility and effectiveness and have direct effects on flexibility and effectiveness.

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<sup>3</sup> Accordingly, effectiveness is defined as information sharing, decision making, and participants' ratings of the organization; these variables have been related to organizational effectiveness in previous research (Benbasat & Lim, 1993; Baird & Henderson, 2001; Campion et al., 1993; Doyle, 2008; Khanna & New, 2008; Kozlowski & Ilgen, 2005; Mesmer-Magnus & DeChurch, 2009; Nissen & Lewelling, 2010; Tiernan, Flood, Murphy, & Carrol, 2002).



**Article III** focuses on trust and its consequences in military ad hoc distributed, culturally diverse teams. It was first hypothesized that cultural diversity will have a negative effect on trust in distributed ad hoc teams. Second, it was hypothesized that cultural diversity influences team processes mediated by trust and that team processes in turn influence outcomes.

The lack of behavioral data in previous research on cross-cultural differences in military samples (Soeters, 1997) raises the question of whether military personnel really express in their behavioral patterns a different culture than their civilian counterparts or whether the VSM lacks predictive value in military samples. Moreover, the last study, reported in **article IV**, investigates the ability of the VSM's I/C measure to predict I/C-type behavior in culturally homogeneous and heterogeneous military teams. Additionally, this study researches whether there is a difference between collectivists and individualists in terms of demonstrating collaborative behaviors in multinational settings.

## **2.2 Method**

### **2.2.1 Design.**

To explore the hypotheses presented above, both surveys and an experimental study were conducted. The studies included four different organizational settings: one laboratory and three field settings. Three different military exercise organizations were studied in the field settings, while a computer game environment that presented a simulated weapons search mission was employed in the laboratory setting.

Collecting data from different organizational contexts minimizes the risk of findings being specific to only one organizational setting. This method may be seen as a triangulation of sources designed to increase generalizability across settings (e.g., Robson, 1993). Because some of the previous research results had proven somewhat equivocal (Hatun & Pettigrew, 2006; Liebeskind et al., 1996; Zammuto & Krakower, 1991), indicating a possible effect of context, this consideration was especially relevant to the study of the predictors of flexibility (article I). To this end, mainly a survey design including different settings was chosen for this research. Participants from one laboratory and three field settings completed questionnaires on their perceptions of the organizational variables in question. Additionally, the laboratory study included an experimental manipulation of cultural diversity, designed to research the moderating effect of cultural diversity on the hypothesized relations with flexibility. Because we depended on military academies for recruiting our participants, participants were not randomly assigned to the experimental conditions (homogeneous/heterogeneous teams), making the design of the laboratory study quasi-experimental (e.g., Shadish, Cook, & Campbell, 2002). To ameliorate this possible flaw in design, all participants were recruited from the same sample (military academy), and likely confounding factors were statistically controlled for.

The above reference to the possible effect of context was also relevant to the hypotheses investigated in article II (effects of flat structure, decentralized processes, and alignment). Hence, concerns about external validity made the surveys design considered the most appropriate for the second article's focus as well. The surveys were thus also conducted in three different field settings.

The article III hypotheses pertained to the consequences of cultural diversity in ad hoc distributed teams for trust, team processes, and output. This objective indicated advantages of a design where the independent variable, cultural diversity, could be manipulated and other factors

controlled for. Along with the causality implied in the hypothesis, these factors were deemed to suggest an experimental design. There were also no indications in the literature of any variability across organizational contexts or study types regarding this research focus, making the threats to external validity less imminent and further supporting the choice of an experimental design for this purpose. As indicated pertaining to article I, the design was defined as quasi-experimental (e.g., Shadish, Cook, & Campbell, 2002). Likely confounding factors were also here statistically controlled for.

In article IV, the aim was to evaluate the predictive value of the VSM's I/C metric in a military sample. The causality inferred by this objective, as well as the advantage of being able to control for other influences (i.e., confounding variables) in addition to the cultural differences in focus, suggested an experimental design. The fact that the bulk of cross-cultural research traditionally has been conducted using survey designs only adds to the appropriateness of an experimental design for this research focus (e.g., Aycan, 2000; Earley, 1997; Hofstede, 1991, 2001; House et al., 2004; Inglehart et al., 2004; Matsumoto, 2007; Oyserman et al., 2002; Schwartz & Sagiv, 1995; Triandis, 1995). Indeed, with some notable exceptions (e.g., Cox et al., 1991; Earley 1989, 1994; Thomas, 1999), there has not been a great deal of experimentation in the field. Studies that have collected both values and experimental behavioral data are even rarer. Hence, the study design of article IV is considered to be a strength as compared with many previous cross-cultural studies. However, when the independent variable is linked to naturally occurring groups such as culture, random assignment is neither the aim nor an option. Thus, the research adopts a quasi-experimental design; this is the standard experimental design where an aspect of culture represents the independent variable (Van de Vijver & Leung, 1997).

## **2.2.2 Participants and data collection procedures.**

### **2.2.2.1 *Field studies.***

The field study data were collected from three military exercises at three different points in time: the NATO Response Force (NRF) Allied Warrior exercise in 2004 (AW04), the NATO winter exercise Battle Griffin in 2005 (BG05), and the fourth Multinational Experiment exercise (MNE4) in 2006. Participants were military officers (as well as 29 % civilian participants in MNE4 and 4 % in AW04) from Canada, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Sweden, Turkey, the UK, and the USA. Personnel at the Combined Joint Operations

Center in AW04 were chosen as this organizational unit at the headquarter (HQ)<sup>4</sup> level had been changed according to new demands for a more effective organization. A tactical-level<sup>4</sup> army unit in BG05 was chosen because this unit represented a new organizational element and had been designed to increase organizational effectiveness. The MNE4 exercise organization at HQ level was chosen based on its focus on effectiveness in coalition and military-civilian collaboration. There were a total of 239 participants in the field studies, but because of missing values on one or more variables, 19 participants were excluded, bringing the field studies sample size to 220. See Table 1 for details and an overview.

Table 1  
*Field Study Overview*

Study venue	<i>N</i>	Composition	Hierarchical level	Services
AW04	28 (25)	Multinational, military	HQ	Joint
BG05	55 (53)	Predominantly national, military	Tactical	Army
MNE4	156 (142)	Multinational, military and civilian	HQ	Joint

*Note.* *N* = total sample size before correcting for missing values; () = *N* after correcting for missing values. Military services are Army, Air Force, Navy, or Joint (the latter indicating that all services are represented).

#### **2.2.2.2 Laboratory study.**

The laboratory study data were collected in 2006-2007 from military officers employing a web-based computer game environment adapted for our research purposes (i.e., the study of cooperative behavior and organizational issues) through the Situation Authorable Behavior Research Environment (SABRE) (Warren et al., 2006). This controlled environment ensured the same conditions for all teams. An increase in team-based distributed computer-mediated and multinational collaboration in military and civilian organizations, which is typical in network organization (e.g., Alberts & Hayes, 2003, 2007; Arnold, Cooper, & Robertson, 1998; Atkinson & Moffat, 2005; DeSanctis & Poole, 1997; Morgan, 1997; Snow et al., 1992), made the use of this tool appropriate for meeting the current objectives.

<sup>4</sup> The military command structure is divided into three main hierarchical levels (listed in order from highest to lowest): strategic (political level), HQ (higher operational level), tactical (lower operational level).

The data collection was an international collaborative effort conducted in Bulgaria, the Netherlands, Norway, Sweden, and the USA within the context of a NATO research group (see Acknowledgements). A total of 55 experimental game sessions were conducted, each with a team of four participants. The participants were military officers from Bulgaria, the Netherlands, Norway, Sweden, and the USA who volunteered for the study. There was a total sample size of  $N = 220$  at the individual level and  $N = 55$  at the group level. As indicated above, article I is partly and articles III and IV completely based on data collected in the laboratory study. In article IV, three participants were excluded because of missing values for the variables in focus, bringing the  $N$  to 217. The questionnaire employed to collect the data for articles II and III was not activated in 23 of the experimental game sessions because of a computer error. This malfunction caused a considerable amount of missing data for the analyses in articles I and III, bringing the  $N$ s to 128 at the individual level and 32 at the group level.

#### ***2.2.2.3 Ethical considerations.***

The participants in all four studies participated on a free-will basis. In the US, they signed forms providing informed consent, whereas informed consent was provided orally in the other participating nations. Because the suggestion to participate in the studies was initially communicated by a unit commander or a military academy teacher, participation may have been viewed as less optional than was intended. However, before participation in all studies, participants were informed by the researchers that their participation was voluntary and that they had the right to withdraw at any time. The methods used were not of the sort that should have imposed any unease or stress on the participants. All methods of data collection were furthermore scrutinized and accepted by the Human Use Committee at the US Army Research Laboratory, which is charged with ensuring the application of ethical standards in military research on humans. Thus, it is believed that the current research did not impose any unacceptable stress on its participants, certainly no more than would be experienced while participating in research on other societal groups. Additionally, this research did not deal with sensitive questions. Anonymity was ensured in all studies; no names of the participants were recorded, and all information rendered was treated with confidentiality. Data have been used and will continue to be available for research purposes only.

### 2.2.3 Variables and measures.

The studies reported in this dissertation are based on a combination of different methods of measurement. Variable measurements can be classified as self-report, experimental manipulation, observer rating, direct behavioral, and direct output. For details on the theoretical background, operationalizations, and measurement, please see articles I-IV. Table 2 provides an article and variable overview, including design, participant numbers, and measurement type.

Table 2

*Article and variable overview.*

Article	Design and methods of data collection	N	Independent and moderating variables	Mediating and dependent variables
I	Field and lab studies in survey and quasi-experimental designs (mixed-methods: self-report and experimental manipulation)	365	Flat structure (SR), Decentralized processes (SR), Pd (IS), Cultural diversity (EM)	Flexibility (SR)
II	Field studies in a survey design (method: self-report)	220	Flat structure (SR), Decentralized processes (SR), Alignment (SR)	Flexibility (SR), Information sharing (SR), Decision making (SR), Organizational rating (SR)
III	Lab study in a quasi-experimental design, (mixed-methods: self-report, experimental manipulation, observer ratings, and direct measures)	128	Cultural diversity (EM)	Trust (SR), Communication quantity (DB), Communication quality (OR), Performance (DO)
IV	Lab study in a quasi-experimental design, (mixed-methods: self-report, experimental manipulation, observer ratings, and direct measures)	217	I/C values (SR)	I/C-related behavior: Reward strategy (SR), Trust (SR), Collective work strategy (DB), Pronoun use (DB), % of total comm. to nearby team members (DB), Total communication (DB), Information sharing (DB), Helpfulness (OR), Communication climate (OR), Competition (OR), Performance (DO)

*Notes.* N = total sample size corrected for missing values, SR = self-report, EM = experimental manipulation, OR = observer rating, DB = direct behavioral measure, DO = direct output measure, IS = index score from Hofstede (2001).

### ***2.2.3.1 Self-report measures.***

The variables of flat structure, decentralized processes, flexibility, alignment, information sharing, decision making, organizational rating, trust, I/C values, and reward strategy were all based on self-report measures. Hofstede's VSM-94 was employed to measure I/C values (Hofstede, 2007, 2001). The rest of the self-report measures were developed on the basis of the theory presented (see both the introduction/theory above and the articles), qualitative data collected in exploratory field and pilot studies, and through peer reviews conducted both in-house and in the context of the NATO RTO HFM-163 research group (see Acknowledgements). The qualitative data collected in the exploratory studies included observational, interview, and qualitative questionnaire data from target raters in a Norwegian air force squadron in connection with a series of military exercises at Ørlandet and Rygge in Norway 2002 (Bjørnstad, 2002; Hafnor & Bjørnstad, 2002), thirteen semi-structured pre-interviews conducted with target raters on site at the AW04 exercise (Bjørnstad, 2005), and experimental pilot studies (Bjørnstad, 2008). In the process of establishing the content validity of the measures, measures were first reviewed by peers and revised, then revised on the basis of feedback from participants in the exploratory field and experimental pilot studies (e.g., Bjørnstad, 2002, 2005, 2008; Hafnor & Bjørnstad, 2002).

Primarily using adaptations of established measures rather than their original versions may be seen as a liability in a quantitative research tradition. However, the use of a data-driven qualitative methodology in addition to the theory-driven methodology in the development of the measures was intended to ensure relevance and representativeness of the measures, which is considered by Pedhazur and Schmelkin (1991) to be one of the most important issues in the choice of measures. The data-driven approach is moreover considered to be advantageous in a more qualitative research tradition as well as in more eclectic ones because it endeavors, first and foremost, to develop measures that are appropriate to the contexts and samples studied (e.g., Kvale, 1996; Richardson, 1996; Robson, 1993). It was deemed important to focus on issues that were relevant in military contexts as well as in the theories that constitute the basis of this research (of which network theories were especially central).

#### ***2.2.3.2 Experimental manipulation, observer ratings, and direct behavioral and output-type measures.***

The research reported in articles I, III and IV employed mixed methods of data collection, which serves to collect different types of variables as well as to minimize the common method bias<sup>5</sup>. For this purpose, Doty and Glick (1998) argue for the use of multiple methods in social science research. The quasi-experimental study design permitted experimental manipulation, observer ratings, and direct behavioral and output measures to be collected in addition to the self-report measures (i.e., on cultural diversity, performance, communication quality, communication quantity, and I/C-related behavior). These characteristics correspond nicely with Bond's (2002) suggestion to use methods other than self-report for the measurement of I/C.

#### **2.2.4 Statistical analyses.**

All four articles employed different statistical analyses, ranging from quite uncomplicated and well-known techniques to more advanced multivariate analyses. The analyses employed in article I (correlation and regression analysis) and in article IV (analysis of variance) are in the former category, and further descriptions of these are assumed to be superfluous. The analyses applied in articles II and III are more sophisticated, and a further explanation of the reasons for choosing them is presented in the following sections.

##### ***2.2.4.1 Structural equation modeling.***

Because the hypothesized relations between latent and observed variables in articles II and III can be represented in path models, i.e., structural models, structural equation modeling (SEM) was considered the most appropriate method of analysis. The SEM analysis tests how well a hypothesized path model fits the data, as indicated by various measures of model fit (e.g., Hu & Bentler, 1999), making SEM particularly well suited for estimating such models.

Additionally, the use of SEM in article II made it possible to test whether the estimated path model was the same in the three field studies, a strategy also referred to as multiple group SEM. This analysis was accomplished by comparing the fit of an unconstrained path model with

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<sup>5</sup> Common method bias is defined as the overestimation of the true relationship between constructs that results from common method variance (Campbell & Fiske, 1959; Cronbach & Meehl, 1955; Doty & Glick, 1998). Common method variance is the systematic variance caused by the use of the same measurement techniques (e.g., self-report) rather than variance in the actual constructs.



the fit of a constrained path model through the chi-square difference test and other measures of model fit. An unconstrained model means that all parameters, such as factor loadings, path coefficients and covariances, are freely estimated within each of the three sub-samples (i.e., these parameters are estimated separately within each sample and thus allowed to have different values). Conversely, in a constrained model, the parameters are preset to the same values in the different sub-samples.

In article III, SEM was used to estimate and evaluate the fit of a hypothesized path model based upon data from the laboratory study. Because one of the dependent/mediating variables in the model (communication quality) was measured at the group level, aggregated scores at the group level had to be used for the other variables in the model. This action resulted in a relatively small sample size at the group level of analysis (i.e.,  $N = 32$ ), especially in terms of the power to detect statistically significant effects, but also regarding the use of SEM to evaluate model fit. Usually, a sample size of at least 200 is recommended to obtain robust estimates of model fit (see, e.g., Hu & Bentler, 1999). As sample size decreases, Monte Carlo simulation studies have demonstrated that most of the model fit measures (the chi-square values being the exception) become poorer (and thus will reject acceptable models too often, see, e.g., Fan, Thompson, & Wang, 1999; Herzog & Boomsma, 2009; Tanguma, 2001). Hence, it is usually more difficult to obtain acceptable model fit measures (such as the root mean square of approximation, RMSEA) in studies using small samples. The question is thus whether a sample size of  $N = 32$  is too low for conducting a SEM analysis. This might not necessarily be the case as Herzog and Boomsma (2009) found that a ratio of sample size to estimated parameters in the model of approximately 2:1 can provide accurate estimates of model fit in small samples if so-called Swain-corrected estimators of model fit are applied (the model in article III had a ratio of 2.5:1). This research led to the decision to employ SEM as one of the main tools of analysis in article III. The robustness of the statistical significance of the parameter estimates in the model in article III was also tested by a bootstrapping procedure (bias-corrected percentile method) (Efron & Tibshirani, 1993).

#### ***2.2.4.2 Multilevel modeling.***

In article III, the use of multilevel modeling (MLM) was found to be most appropriate to analyze variables at the individual level because the participants were nested within teams. If members within a team tend to have more similar scores on the dependent variables (trust,

communication quantity, and performance) compared with members of different teams, a consequence is that standard errors may be biased from a violation of the assumption of independence of errors (see, e.g., Hox, 2002). MLM can take such sources of systematic error variance into account simultaneously and was therefore performed to make the tests of statistical significance more reliable. A two-level hierarchical model was employed to assess differences in mean trust scores between culturally homogeneous and culturally heterogeneous teams and to estimate the relationships between team heterogeneity, trust, communication quantity and performance. First-level units were the 128 participants and the 32 teams were the second-level units in the hierarchical models.

## **2.3 Summary of Results**

### **2.3.1 Article I: Organizational flexibility from a network organizational perspective: A study of central predictors and moderating factors in military contexts.**

The first article investigated organizational structure and processes as antecedents of organizational flexibility, as proposed by network organization theories. Possible moderator effects of power distance and cultural diversity were also explored. To study this, primarily a survey design was employed in both field and laboratory settings; self-report data were collected from three military exercise organizations and one series of laboratory experiments. Additionally, the experimental study was designed to test the possibility of a moderating effect of cultural diversity. The data from each of these studies were analyzed both separately and conjunctively, revealing that decentralization was the most consistent predictor of organizational flexibility across each of the four studies.

Moreover, decentralization was found to significantly predict flexibility in all three field studies, whilst flat structure was found to significantly predict flexibility in two of the field studies. Although there were no significant separate effects of the independent variables in the laboratory study, there was a significant collective effect (i.e., the regression model was significant), which was interpreted to be the result of a relatively high intercorrelation between the independent variables. In the laboratory study, the same trend in the data was observed at both the individual and group levels of analysis, suggesting the same relationships at both levels of analysis. No moderator effects were found in any of the studies.

Analyzed together, the data revealed significant relationships both between decentralization and flexibility and between flat structure and flexibility. These results suggested that decentralizing processes as well as flattening the hierarchy may contribute towards achieving higher levels of flexibility in military organizations. Thus, an important implication for obtaining more flexible military organizations than currently exist would be to focus on organizational changes to structure and processes. Although, no moderator effects were observed when analyzing the data together, there was found a negative main effect of cultural diversity on flexibility. This latter result suggested a need for more research on cultural diversity.

### **2.3.2 Article II: Exploring network organization in military contexts: Effects of flatter structure and more decentralized processes.**

The second article explored potential consequences of network-type organizational changes for effectiveness in military contexts - that is, of flattening structure, decentralizing processes, and aligning structure and processes. To this end, self-report data were collected in three different military exercise organizations.

The results of the analyses indicated that flat organizational structure predicted effectiveness (i.e., as measured by information sharing, decision making, and organizational rating), with the effects being almost fully mediated by flexibility. One direct effect was observed - of flat structure on decision making. The analyses further indicated a positive effect of decentralized processes on effectiveness, which was fully mediated by flexibility. The effectiveness measures were in turn found to be interrelated; the analyses demonstrated that information sharing partially mediated the effects of flexibility on decision making and organizational rating. These findings imply that the anticipated positive effects (i.e., increased effectiveness) of the network organizational variables studied (i.e., flat structure and decentralized processes) were supported and that flexibility may be understood as largely mediating these effects.

Alignment between structure and processes was found to have a significant effect on one of the effectiveness measures, i.e., organizational rating, suggesting that flat structure should be accompanied by decentralized processes and vice versa in order for the personnel to perceive the organization as functioning well. No support was found for any effect of alignment on the other effectiveness measures (information sharing and decision making); nor was any support found for moderating effects of alignment. Follow-up analyses suggested that there may not have been sufficient misalignment issues between structure and processes in the organizations studied to yield all of the expected effects. The results nevertheless indicated that flatter structure and decentralized processes provide increased flexibility and effectiveness in organizations where the structure and processes are well aligned. Because the data may not have been adequate to reveal whether misalignment between structure and processes would yield any different results, further research is needed to establish this.

### **2.3.3 Article III: Effects of cultural diversity on trust and its consequences for team processes and outcomes in ad hoc distributed teams.**

The consequences of multinational distributed ad hoc team collaboration were examined in the third article. Moreover, this article explored trust as a mediator to explain how cultural diversity may affect team processes and outcomes in distributed ad hoc teams. To this end, data were collected through self-report, observer ratings, and direct behavioral measures from an experimental series conducted in a laboratory setting. A distributed collaborative computer game environment adapted for the purposes of the research was employed, representing a new approach to studying trust and team collaboration in multinational and national teams.

The analyses demonstrated a significant difference in trust between culturally homogeneous and culturally heterogeneous ad hoc teams in the distributed setting. Moreover, cultural heterogeneity resulted in lower trust at both the individual and group levels of analysis. In turn, trust was found to predict communication quality at the group level (group-level measure).

Trust was also found to interact with team diversity in terms of influencing communication quantity. Specifically, trust predicted the amount of communication in the heterogeneous groups. Although this finding was only significant at the individual level of analysis, the same tendency was observed at the group level. These findings suggest a double challenge; in international as compared with national ad hoc distributed teams, trust may at the same time be lower and have more consequences for some collaborative-type behaviors. Correspondingly, trust could be understood as a catalyst for communication in culturally diverse teams. Team performance was not significantly predicted by the communication measures, though the observed relations were in the hypothesized direction. On the basis of this finding and some uncertainties of interpretation, no conclusions were drawn pertaining to performance.

The results imply that trust may add explanatory value as a mediator in future team composition research; that internationally composed distributed teams may be less than optimal if organized ad hoc; and that allocating the time to build trust in such teams may thus be worthwhile. Suggestions for future team composition research included considering trust as a mediator and exploring how best to build trust in international distributed teams.

#### **2.3.4 Article IV: A multi-method study of cultural values and behavior: Does Hofstede's individualism/collectivism measure predict team type behavior in an international military experimental setting?**

The fourth article examined the use of Hofstede's survey tool VSM-94 to measure I/C in an international military sample and focused on the relationship between values and behavior in culturally homogeneous and heterogeneous teams. To this end, a quasi-experimental multi-method design was adopted, employing self-report, observer ratings, and direct behavioral measures, and conducting the study in a laboratory environment. This study employed a distributed collaborative computer game environment for researching the cross-cultural issues in focus, thus exploring new methods in cross-cultural experimental research. Such methods provide a lower threshold for cross-cultural experiments to be conducted.

The results indicated discrepancies between the I/C values as measured by the VSM-94 and the measurements of I/C-type behaviors (measured by direct behavioral measures, self-report, and observer ratings) in a military sample. The current measures of I/C values did not reproduce the rank order on the I/C dimension found in previous research with civilian samples (e.g., Hofstede, 1991, 2001). However, further analyses revealed that the different I/C behaviors measured in the current study were better predicted by Hofstede's original I/C values scores (Hofstede, 1991, 2001) than by the current VSM-94 I/C values scores. These results were interpreted to indicate that the VSM-94 may not be an adequate measure of I/C in a military population. This interpretation was supported by an earlier study of a military sample by Soeters (1997). Soeters' VSM I/C values scores matched the current study's VSM I/C values scores and were similar to the current study unrelated to Hofstede's original I/C values scores. As such, the present study also served to propose a new explanation of Soeters' results; rather than a real difference in I/C existing between civilian and military populations, as previously argued (Soeters, 1997), the results implied that the VSM metric may not capture the I/C construct satisfactorily in military samples. It was suggested that future research focus on how the VSM can be modified for use in samples such as the military and evaluate measures of I/C other than the VSM for such contexts (i.e., operational organizations such as the military, medical, police, or crisis relief). The study did not reveal whether individualists or collectivists were better at collaborating in multinational teams; the results indicated no systematic differences between cultures.

### **3. Discussion**

#### **3.1 General Discussion, Implications, and Suggestions for Future Research**

As presented in the introductory section, the different focus areas of the four articles reported in this dissertation are intertwined by their common origin in network theories. Some central interconnections between the results of the different focus areas are discussed below. These discussions further contribute to suggestions for future research.

##### **3.1.1 Consequences of flat structure, decentralization, and their alignment for flexibility and effectiveness.**

If it is indeed the case that the interconnections between the perceptions of the organizations' structure, processes, and flexibility studied in article I reflect the interconnections between these organizational variables at a more objective level, then the collective findings of this article support two of the basic hypotheses of network theories—that flatter organizational structures and decentralization will each lead to greater flexibility (e.g., Alberts & Hayes, 2003; Arnold et al., 1998; Galbraith, 2002; Volberda, 1998; Zammuto & Krakower, 1991). The present results also contribute to research beyond network theory by adding empirical evidence from military organizational contexts to the literature on the links between structure and flexibility and between processes and flexibility (e.g., Hatum & Pettigrew, 2006; Volberda, 1998; Zammuto & Krakower, 1991). Because the empirical evidence was equivocal regarding the processes-flexibility link (e.g., Hatum & Pettigrew, 2006; Zammuto & Krakower, 1991), the present results also served to clarify the nature of this link in military contexts.

The results further suggested that decentralization is a relatively more important variable for achieving organizational flexibility than is flattening the hierarchy and might even constitute a prerequisite for flexibility. An explanation suggested in military network theories (e.g., Alberts & Hayes, 2003; Roman, 1997) is that decentralization empowers lower organizational echelons to respond to local conditions and makes information more available for them to make qualified decisions. Observations of the development in many military organizations indicate a different trend, though; instead of a decentralization of processes, there seems to have been more of a centralization in many military operational organizations (Bolia et al., 2003; Roberts & Smith, 2003; Vego, 2003). Moreover, neither flattening of hierarchies nor decentralization seems to be part of the trends in military organizational development (for a discussion, see Bjørnstad, 2004),

suggesting that flexibility may not be attained in many military organizations despite this being their espoused goal. Zammuto and O'Connor (1992) furthermore found flexibility to be linked to the successful implementation of new technology; they revealed that new technology was not adequately exploited in non-flexible organizations. Additionally, Bloom et al. (2009) found a close relation between decentralization and the successful exploitation of new information technology. Hence, both decentralization and flexibility may be key organizational features to fully realize and exploit new technology. As the military network perspective is founded on the implementation and use of new information and communication technologies, these findings indicate that organizational changes will be crucial to taking these steps successfully.

The interpretation that the success of network organization in military organizations may depend on achieving flexibility was further corroborated in the article II findings; flexibility was found to almost fully mediate the effects of flat structure and decentralized processes on the effectiveness variables. Very little support was found for the hypothesized direct effects of structure and processes on effectiveness. Furthermore, the finding that information sharing partially mediated the effects of flexibility on decision making and organizational rating confirmed both the centrality of information sharing for the organizational output and that information sharing may be increased by network organization-type changes such as flattening structures and decentralizing processes. Moreover, the finding that both flexibility and information sharing mediate the effects of flat structure and decentralized processes provides empirical evidence of the purported centrality of these variables in the network organization literature (e.g., Alberts & Hayes, 2003). In fact, because fewer direct effects than expected were found, the centrality of flexibility in the present results can be understood to be even greater than anticipated from the network literature.

The current results thus propose that the military, traditionally bureaucratic types of organizations, may benefit from a flatter structure and more decentralization to reach their goal of increased flexibility and effectiveness—quite in line with network theories (e.g., Alberts & Hayes, 2003; Snow et al., 1992). The present work thus brings the theoretical foundation of network theories closer to implementation in military organizations as empirical support for these propositions of network theories has largely been missing.

For the successful implementation of network enabled capabilities, involving large-scale changes to military organizational structures and processes, it will be important to continue to



expand on the results of the present findings, implementing and evaluating such changes in military exercise organizations. However, this will not be a trivial task as there has been a reluctance to make any real changes to military organizations, including those in network (i.e., NNEC) type exercises, where the primary focus of change has been within the realm of the implementation of new technology (Roberts & Smith, 2003).

The research presented in article II provided only limited support for the proposition that organizational structures and processes need to be aligned for the organization to be efficient. However, the shortcomings were explained by a lack of misalignment issues in the data studied. The relationship between alignment and the rating of the organization and the finding of the anticipated effects on output of structure and processes in apparently well-aligned organizations were interpreted as lending some support to the suggestion that the simultaneous implementation of changes to both organizational structure and processes is advantageous. Simultaneous implementation of changes to both structure and processes in organizational development ensures that the information and decision-making loads do not exceed the capacity of the higher levels in the hierarchy and empowers the lower levels to respond in adaptive ways to the demands of the situation, hence creating room for flexibility. By interpreting the current results alongside past theory and research (Dekker & Suparamaniam, 2003; Galbraith, 2002; Kotter, 1978; Kvande, 2007; Vego, 2003), it is proposed that both future research and organizational change implementation should be conscientious about maintaining or achieving internal alignment of the organizational components. Adding a focus on the alignment of focal organizational components in future studies could also help researchers to better discern which organizational solutions are superior, thereby lessening the conflicting findings that are not uncommon to the literature on organizational variable relations (e.g., Carley & Lin, 1997; Hatum & Pettigrew, 2006; Liebeskind et al., 1996; Richardson et al., 2002; Zammuto & Krakower, 1991). Nevertheless, the shortcomings described in the present study (article II) indicate a need to study the effects of alignment further in future research.

Although, the article I moderator analyses indicated no effect from cultural diversity and Pd on the flat structure-flexibility and the decentralization-flexibility relationships, there were indications of a negative main effect of cultural diversity on flexibility. The article I study could not reveal the underlying reasons for this negative finding; however, the double-edged sword of team diversity is a well-known issue in team diversity research (e.g., Mannix & Neale, 2005).

Despite the increased problem solving potential of diverse teams, coordination issues and process loss are familiar challenges (Mannix & Neale, 2005). The issue of team cultural diversity was further investigated in the article III study. This study offered more insight into the effects of diversity for trust, team processes, and output.

### **3.1.2 Trust.**

The article III results indicated that cultural diversity may have negative effects on central team processes, which are mediated by trust, in ad hoc distributed teams. It was found that trust adds explanatory power to the many mixed findings reported in meta-analyses and reviews of research on team composition and effectiveness (e.g., Bowers, Pharmer, & Salas, 2000; Horwitz, 2005; Mannix & Neale, 2005; Stahl, Maznevski, Voigt, & Jonsen, 2010; Webber & Donahue, 2001). The results suggested that trust provide a clarification as to how team diversity affects team processes. The present research contributes to the field by showing that trust may explain results from both demographic and competency types of diversity research. Indeed, unless trust is established in heterogeneous teams, the potential advantages contained in the collective capacity of the team (e.g., increased knowledge, viewpoints, and creativity) may not be realized. This finding also adds to Van Knippenberg, De Dreu, and Homan's (2004) model; introducing trust explains the psychological processes by which group bias can affect group processes as well as those by which elaboration can be made difficult and likewise affect group processes. Group bias and social schemas were not the focus in the present research, but these may be fruitful areas for future research.

Previously, several moderators have been proposed in team research. For instance, Bowers and colleagues (2000) focused on the type and difficulty of the task, Horwitz (2005) proposed five moderators (i.e., team type, team size, task complexity, task interdependence, and frequency and duration of interaction) and Mannix and Neale (2005) found that different types of diversity (demographic- and competency-based) may yield different types of effects on team processes and outcomes. However, trust has not been proposed as a moderator or a mediator in this research. The results of article III contribute to this research by suggesting that trust be added as a mediator in future team composition research.

Mannix and Neale (2005) proposed the use of elements such as common goals, identity or team culture to bring heterogeneous team members closer together. The results reported in the

present dissertation suggest that a common goal, organizational culture (NATO military) and identity (military) are not enough to override national cultural differences, at least not in ad hoc distributed teams. The current results support research on trust in general, which has indicated that it is more difficult to build trust between people who are dissimilar than between people who are similar (e.g., Ibarra, 1993; McAllister, 1995; Webber, 2008). Though a superordinate common identity may reduce group bias (e.g., Stone & Crisp, 2007), research by Laurent (1983) and Van der Zee, Vos, and Luijters (2009) indicates that introducing a common identity may also backfire, i.e., if the common identity is perceived as a threat to the individuals' existing identity.

On the basis of current and previous research (e.g., Ibarra, 1993; Kim, Cooper, Ferrin, & Dirks 2004; Linskold, 1978; Webber, 2008), the logic seems to be that the more culturally diverse the team is at the outset, the more time and effort may be needed to build trust. Increasingly, both civilian and military organizations collaborate across borders, making this an important insight to consider to avoid the pitfalls and reap the benefits of cultural diversity in teams. If there is insufficient time and opportunity to establish trust in culturally diverse teams, the current results suggest negative effects on key team processes such as communication. The article III results thus also suggest a possible explanation for the article I results, i.e., that cultural diversity was found to give lower flexibility. Trust may be central for realizing the possible advantages of diversity also in regards to flexibility. By combining the results from articles I and III, it is suggested that future research continue to focus on the relation between cultural diversity and flexibility, and on whether this relation is moderated by trust.

Additional solutions to dealing with cultural diversity could be to increase knowledge about how people from the culture to be collaborated with behave and think on a general basis, as well as to train the practical skills of team members on how to collaborate across cultures. According to Triandis (1995), simply interacting with people from other cultures will also develop both the specific skills that are necessary to work with people from the cultures exposed to, and the general adaptability to work in any culturally heterogeneous team. Research by Lee et al. (2010) demonstrated a positive effect of training together prior to distributed collaboration. This training was found to eliminate any differences in trust between collocated and distributed teams. Training together may be especially important when the teams are culturally diverse in addition to being distributed, as they were in the present research, reflecting a network organizational context.

There is also the possibility that certain cultural characteristics may predispose people to confer higher or lower trust. The cultural dimension of I/C may be such a characteristic. For instance, Cox and colleagues (1991) found that people from collectivist cultures tended to trust other people more compared with people from individualist cultures. Differences in I/C were further investigated in the article IV study.

### **3.1.3 Collectivism, collaborative behaviors, and effectiveness.**

Article IV did not resolve the question of whether individualists or collectivists are better at collaboration in culturally diverse contexts. Hence, it is suggested that future research continue to explore this question (i.e., whether collectivists outperform individualists because of better collaborative abilities or whether individualists outperform collectivists because of collectivists' tendency to differentiate more between ingroup and outgroup members).

In general, the I/C-type behaviors studied in article IV were not predicted by the current VSM-94 I/C measurements. However, Hofstede's original scores on the dimension turned out to be better predictors of the behaviors, leading to the conclusion that the VSM-94 instrument may not measure I/C adequately in military samples. Moreover, the I/C-type behaviors observed in the military sample studied indicated that I/C is no different in military than in civilian populations, contradicting an earlier interpretation of a VSM survey from a military sample (Soeters, 1997). This conclusion concurs with, e.g., Hofstede's (1991, 2001) construal of the value dimensions; although scores may be expected to vary somewhat across subgroups within a given culture, rank order differences across cultures are expected to be relatively stable if the samples are well matched across cultures. Hence, the present research contributes to a clarification and a reinterpretation of past research.

If the I/C metric is simply inappropriate for use in a military population, as suggested by the present research, this finding should have consequences for future research. All items of this metric may not be equally applicable in all contexts; the respondents' interpretation of the items and the items' salience could be dissimilar in different contexts, such as business and military. It is suggested that future research focus on how the VSM can be modified for use in samples such as the military and evaluate other measures of I/C than the VSM for military and other previously little-researched contexts. On a more general note, it is hoped that the current findings will inspire more researchers to employ behavioral measures to further inspect the validity of

survey instruments for measuring national cultural differences within various societal subgroups. Such research would help to clarify both the extent of subgroup differences and the validity of the instruments across the different subgroup contexts in which they are employed.

#### **3.1.4 Advantages and disadvantages of implementing network organization in military organizations.**

The results of the first two articles presented in this dissertation largely suggested that implementing network organization-type changes like flattening structures and decentralizing processes would be advantageous to an organization's flexibility and effectiveness. Military organizations doubtless have far to go, considering that their hierarchical structures and centralized processes have not changed much in the last hundred years (e.g., Bjørnstad, 2004). Indeed, those changes that have been made more often seem to move the organizations toward centralization rather than decentralization (e.g., Vego, 2003). Such trends have been understood to be a result of new information and collaborative technologies being implemented primarily to provide the top layers in the organizational hierarchy with improved information access and capacity to execute command (e.g., Bjørnstad, 2004). This kind of development, however, limits rather than expands the flexibility and decision-making capacity of the organization. Moreover, by decreasing the number of individuals who are able to make decisions, there is a risk of a complete stall in the decision-making processes in times of increased decision-making load, which is typical of high-demand and high-velocity circumstances (e.g., Vego, 2003).

Hence, the current research, interpreted in the context of previous research on military organizations, suggests a need to flatten hierarchies and decentralize structures of military organizations in order for them to improve their flexibility and effectiveness. However, as the current research gives little information on how much change is recommended to attain optimal function, this may be a direction for future research. For instance, such a focus could be introduced in real-life experimentation and implementation of organizational changes, where a close evaluation and monitoring of effects is recommended.

The question of how much change is needed becomes especially pertinent because suggestions about the advantages of hybrid organizational types have been made in the newer literature (Graetz & Smith, 2007; Klein, Ziegert, Knight, & Xiao, 2006). Hybrid forms ideally maintain the stabilizing effects of a traditional bureaucratic type of organization while also

implementing changes to achieve the dynamism of the newer network types (e.g., Volberda, 1998). This literature supports less radical changes to existing organizational structures and processes than are suggested in network theories. At the same time, the research results in this dissertation indicate that if there is little change in the hierarchical structures and centralized processes within traditional bureaucratic types of organizations, like the military, the organization is less likely to increase its flexibility and effectiveness. Furthermore, hybrid forms of organization may involve a risk; the importance of understanding how to combine the elements of the two organizational forms would increase if aiming for a hybrid form. Rather than combining the advantages of the two organizational archetypes, a hybrid form could potentially promote the disadvantages of both. Indeed, hybrid forms of organization would only increase the importance of ensuring internal alignment of organizational components.

Disadvantages of network organization pertaining to an increased use of ad hoc distributed multinational teams were indicated in the results of article III. Although diversity has the potential to increase problem-solving and decision-making abilities, this research corroborated an expectation that cultural diversity may be a liability in ad hoc distributed teams because of the risk of lowered trust, which, in turn, influences the communicative and collaborative processes negatively. Hence, it is suggested that multinational teams, rather than being ad hoc composed, ought to be granted sufficient time to build trust. Or, if there is no time, it seems better to rely on ad hoc teams that are homogeneously composed in terms of culture.

Article IV's results largely corroborated research on I/C in civilian populations (e.g., Hofstede, 2001; Hoppe, 1990, 1998), contradicting the suggestion made by Soeters (1997) that military populations possess different cultural values than their civilian counterparts. If the current interpretations are true in that the past national rankings on I/C in civilian populations are also representative of military populations, this indicates that central NATO members (such as the US and the UK) are at the most individualistic end of the continuum. Having a more individualistic culture may suggest greater difficulties in adapting to the collectivistic interaction advocated for in the military network literature (e.g., Atkinson & Moffat, 2005). However, many NATO countries are located closer to the middle of the I/C dimension (such as Norway), and others lie further toward the collectivist end of the dimension (such as the Southern European and most of the new Eastern European NATO members). It may be hypothesized that the more collectivistic types of cultures would have better chances of achieving the increased

collaboration that the network theories suggest, at least in single-nation contexts. Conversely, it may be that the greatest hurdle does not reside in the individualist orientation in itself but rather in the differences found between cultures. This proposal is similar to the current findings on trust in multinational ad hoc teams and echoes many years of cross-cultural research (e.g., Bochner & Hesketh, 1994; Earley, 1994, 1997; Hofstede, 1991, 2001; Trompenaars, 1997; House et al., 2004; Offermann & Hellmann, 1997; Smith & Bond, 1998; Thomas, 1999; Triandis, 1994; Veiga and Yanouzas, 1991); the differences may be some of the greatest challenges to the seamless collaboration suggested in network organization.

Given this dissertation's research findings, the above discussion indicates that there most probably will be both advantages and disadvantages linked to the implementation of network-type organizational changes in military organizations. The findings indicate that all change should be monitored closely to understand what works, how it works, and what would be the optimal level of change.

### **3.2 Methodological Issues**

#### **3.2.1 Self-report measures.**

The results of the research reported in articles I and II are based on participants' perceptions rather than on direct organizational measures, in line with the research on which these studies were based (e.g., Campion et al., 1993; Richardson et al., 2002, Zammuto & Krakower, 1991). Employing participants' subjective perceptions to make inferences about an organization's characteristics is often considered to be the most relevant approach in organizational studies (Patterson et al., 2005; Spector, 1994); the collective reality of an organization may be understood as the sum of the realities perceived by its participants (e.g., Patterson et al., 2005).

#### **3.2.2 Common method bias.**

The use of primarily self-report measures in the research reported in articles I and II may be seen as a limitation because of the common method bias (e.g., Campbell & Fiske, 1959; Cronbach & Meehl, 1955; Doty & Glick, 1998). However, both Doty and Glick (1998) and Conway and Lance (2010) argue that the problem of common method bias is substantially exaggerated in organizational research. Indeed, the work of Conway and Lance (2010) indicates that the problem of underestimating relationships when using different methods (Type II error) is

greater than that of overestimating relationships when using the same methods (Type I error). Doty and Glick (1998) suggest that employing different wordings and different response formats in self-report measures will serve to minimize the common method bias. Therefore, to minimize this bias, the response formats employed in the variable measurements in articles I and II were deliberately different, employing bipolar descriptive measurement scales. The use of bipolar descriptive scales instead of the more common Likert-type scales with identical response denominators (agree/disagree) should both lessen the risk of common method bias and yield the same information by posing one instead of two questions.

In articles III and IV, common method bias should not be an issue as variable measurements in the experimental study design were not only self-report but also included experimental manipulation, observer ratings, and direct behavioral and output measures.

### **3.2.3 Single-item measures.**

Some of the variables (i.e., flat structure, decentralized processes, flexibility, organizational rating, and reward strategy) were assessed by single-item measurement scales. The choice of single-item scales was mainly related to a requirement to keep questionnaire length down, as the items were part of a larger survey battery and the respondents were under considerable task pressure (especially during the exercises). These circumstances made brevity critical to induce as little fatigue as possible, achieve high-quality responses, and ensure the feasibility of the studies. The focus on perceptions of organizational attributes rather than on underlying psychological constructs permitted less lengthy and more straightforward measurements (e.g., Bergkvist & Rossiter, 2007; Rossiter, 2002).

Arguably, the single-item measurements employed may be considered a weakness. As indicated by Gosling, Rentfrow, and Swann (2003), single-item scales have most often been found to be less reliable and valid than multi-item scales when measuring psychological constructs. However, the focus on variables such as perceptions of organizational attributes rather than on underlying psychological constructs has been found to allow for shorter, more straightforward measurements (e.g., Rossiter, 2002). Indeed, single-item measures are sometimes even deemed preferable (Rossiter, 2002). Single-item scales have the advantage of minimizing item redundancy, time for completion, and participant fatigue (Gardner, Cummings, Dunham, & Pierce, 1998), all of which were important concerns in the current research. Wanous, Reichers,



and Hudy (1997) successfully tested and employed a single-item measure of job satisfaction, concluding that the use of single-item measures should not be considered a fatal flaw. More recent research has also demonstrated the usability of single-item measures in studies ranging from student ratings of teaching effectiveness to marketing, perception of task difficulty, and group norm and ingroup identification (Bergkvist & Rossiter, 2007; Jimmieson, Peach, & White, 2008; Li, Lee, & Solomon, 2007; Wanous & Hudy, 2001). However, future research may consider more comprehensive measures where such measures are feasible.

### **3.2.4 Levels of analysis.**

Measurement and statistical analyses of organizational variables researched in articles I and II were conducted primarily at the individual level. Individual perceptions were expected to vary, which makes it possible to measure and analyze organizational issues at the individual level, hence following an accepted practice in organizational research to employ individual measures to research organizational issues (e.g., Peterson & Castro, 2006). There is, however, a discussion of the issue of levels of analysis in the organizational research literature (e.g., Klein, Danserau, & Hall, 1994; Peterson & Castro, 2006; Schnake & Dumler, 2003). In order to address some of the concerns raised in this literature, two measures were taken. First, in the field studies, the organizational items were phrased in a comparative manner. This means that, the participants reported their perceptions of differences in structure, processes, and flexibility in their current exercise organization in comparison to the structure, processes, and flexibility in the organization where they normally worked. The measurements in the field studies were thus explicitly relative to each participant's prior organizational experiences. This becomes an advantage when researching the relationships between the variables. As each individual evaluation is explicitly relative to their normal organizational setting, the analysis of a relationship between these variables will be relative to the functioning of many organizations, and not simply a reflection of the way many individuals perceive the one exercise organization. This approach was chosen to ensure the variance at the individual level and thus better capture the organizational issues, suggesting that the findings may be understood at an organizational level. Second, in the laboratory study, participants were organized into teams to permit additional analyses at the group level (which made it superfluous to phrase the questions in a comparative manner in this study). Moreover, the team-level relevance of the researched topics made it theoretically sound

to analyze the relations between the variables also at the group level (e.g., Klein et al., 1994). Analyzing the laboratory data at two levels addresses the concern that associations between variables in aggregated data may differ in magnitude or sign from those found between the variables in individual-level data analyses (e.g., Rousseau, 1985). In so doing, this method of analysis satisfies the concerns raised by Schnake and Dumler (2003) regarding the all too common focus on a single level of analysis in organizational research.

The theoretical background and cited research on which article III is built stem from both individual- and group-level research, and both antecedents and consequences of trust are thought to have relevance at both levels (Serva, Fuller & Mayer, 2005). This research indicates that each level plays an important role in the topics addressed and that the hypotheses may gainfully be studied at both levels. Results from the present research (article III) were found to persist across group and individual levels of analyses. This two-level focus makes our results more interpretable in comparison with past and future research conducted at either the individual or the group level of analysis.

In article IV, the main analysis was conducted at the level of national cultures, in accordance with the I/C construct studied. A suggestion for future research, as also raised by Huang and Van de Vliert (2003) in relation to cross-cultural research, would be to take both the national and the individual levels into account in the same analysis. This consideration can be achieved by using the statistical method of MLM. This kind of statistical tool would alleviate some of the limitations in the present research but would require a sample of at least 25-30 different national cultures (Hox, 2002) and 25-30 participants from each culture (e.g., Hofstede, 2001).

### **3.3 Generalization Issues**

#### **3.3.1 Choice of design/methods and generalizability.**

Article II cross-validated the same relations between variables in three different samples and organizational contexts. Article I cross-validated the same relations in four different samples and organizational contexts, with a slight difference in the tools of measurement used in the field and laboratory settings. These factors strengthen the findings in terms of replicability and generalizability.

The study design of article IV is considered to have some methodological strengths compared with many previous cross-cultural studies: it includes participants of more than two different nationalities; it does not rely on a student sample; and it employs different types of measurements (i.e., both behavioral and self-report measures). These sample and measurement characteristics add to the generalizability of the findings reported in article IV. However, as indicated above, increasing the number of nations in the study sample substantially (i.e., to 25-30) would have improved the possibility for more advanced analyses, thereby adding more strength to the findings. While adding more strength to the findings is considered advantageous, it would require vast resources to conduct cross-cultural experiments with the sample size described above as necessary for MLM. These impracticalities explain why this type of research remains to be performed.

Some may question whether a computer-based game is the best way to study organizational issues, trust, and collaborative behavior in teams (articles III and IV). Although not in the same context as in this dissertation, such games have previously been employed successfully in research on human behavior (e.g., Aidman & Shmelyov, 2002; Devine, Martin, Bott, & Grayson, 2004). Additionally, the computer-mediated collaborative setting is considered to be a very relevant context to the current investigations into issues related to network organization.

As regards the organizational issues researched in article I, the game context was only one of four different contexts and the only one that can be regarded as in some ways synthetic. The game environment provided an additional but nonetheless also a relevant distributed context. The concurring results across such different contexts are considered to strengthen the results in terms of generalizability.

Because collaboration, and especially international collaboration, is increasingly computer-mediated and distributed, the current research method is growing in relevance. Using a game environment with distributed collaboration may also provide a lower threshold for cross-cultural experiments in future research; because participants may contribute from their home countries, no travel is required. However, as the experiences reported in article IV also indicate, there is a need to be aware of the limitations of such studies in relation to the requirement of a minimum level of computer game and language proficiency of the participants. The latter is, of course, a prerequisite in all research on cross-cultural team behavior.

### **3.3.2 Generalizability to other (non-military) contexts.**

The samples in these studies consisted of military personnel and were therefore well suited for the aim of this project to provide new knowledge about potential effects of network type changes on military organizations. However, some conditions of the studies should make the results relevant also to non-military settings. First, most previous organizational research has been conducted in an industrial or business organizational environment, leaving both military and other operational-type organizations, like the medical, police, or crisis relief, as less well-researched environments. It seems probable that such non-military operational-type organizations, including the governmental and non-governmental organizations operating in the same conflict areas as do military organizations, may have more in common with military than with business organizations. Compared with business organizations, operational organizations share a common context of a faster pace and higher complexity, risk, and stakes, combined with less controllability of rapidly changing environments. Second, the data collected and the analyses performed focus on organizational variables that have relevance beyond military organizations. The research in article IV is a bit different as its goal was to investigate the predictive value of a measurement of culture (the VSM's I/C metric) in a military sample. The lack of such predictive value nevertheless raises the question of whether the metric may have similar weaknesses when employed in other operational-type organizations. Third, although the experimental game scenario was a simulated mission, the collaborative tasks are believed to be applicable also to non-military settings.

For some variable relationships, context may also be an issue. This issue is implied by the equivocal results of previous research from non-military organizations concerning the relationship between decentralization and flexibility (Hatum & Pettigrew, 2006; Liebeskind et al., 1996; Zammuto & Krakower, 1991). To address this concern, articles I and II were mainly based on field studies of different military organizations. The inclusion of the laboratory study data in article I should only strengthen the generalizability of findings across contexts.

### **3.4. Conclusion**

This dissertation has investigated hypothesized effects of network organization issues, with a focus on military organizations. Network organization includes changes to central

organizational variables like structure and processes as well as increased ad hoc, distributed and multinational collaboration.

It was found that flatter and more decentralized organizational solutions may allow more flexibility and in turn enable more efficient organizational processes, including improved information-sharing and decision-making processes. These may be interpreted as positive results in terms of corroborating the network organization hypothesis of increased output. The present work thus contributes to bringing the theoretical foundation of network theories closer to implementation in military organizations as little empirical material on these propositions of network theories exists. However, the results also linked cultural diversity to lower flexibility and demonstrated significantly lower trust in culturally diverse distributed ad hoc teams than in homogenous teams, suggesting that network organizational solutions do not have uniformly positive effects. These results nevertheless confirm previous research demonstrating that diversity can make it more difficult to build trust. In turn, trust was found to be positively related to collaborative team processes (i.e., communication). These findings imply that multinational ad hoc teams may not be optimal, at least when collaboration is distributed and computer-mediated, which indicates a need to allocate time for the building of trust in multinational teams. Additionally, the results suggested that trust can add explanatory value as a mediator in future team composition research.

Finally, it was found that behavior could not be predicted by the current I/C measurements employing Hofstede's VSM-94 survey tool in a military sample. However, behavior was better predicted by Hofstede's original scores (from his IBM sample), suggesting that the VSM-94 is not measuring I/C adequately in military samples. These results proposed that country differences in I/C are no different in military than in civilian populations, as previously concluded in a study from a military sample (Soeters, 1997), which further suggests a re-examination of other research that has proposed within-culture subgroup variability in I/C based on self-report measures only. The results did not indicate whether individualists or collectivists are better at collaboration in culturally diverse contexts.

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Organizational flexibility from a network organizational perspective: A study of central  
predictors and moderating factors in military contexts

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### Abstract

This study focuses on organizational flexibility and explores organizational structure and processes as its antecedents as proposed by network organization theories. The study also explores possible moderator effects of power distance (Pd) and cultural diversity. Using self-report data from three different multinational military exercises and one laboratory experiment, the relationships between perceptions of flat organizational structure, decentralized processes and flexibility were explored. The data from each of these studies were analysed both separately and conjunctively. The analyses revealed that decentralization was the most consistent predictor of organizational flexibility across each of the four studies. Moreover, when the data were analysed conjunctively, significant relationships between decentralization and flexibility and between flat structures and flexibility were observed. No moderating effects of Pd or cultural diversity were found. The research contributes to providing empirical support to central theoretical propositions made in network organizational literature, including also moderating factors essential in multinational organizational contexts.

*Keywords:* Flexibility, flat structure, decentralized processes, network organization, cultural differences.

## Introduction

Military organizations typically operate within high tempo and rapidly changing environments that have become increasingly diverse, complex, and multinational in nature (Alberts & Hayes, 2003; Atkinson & Moffat, 2005). Both the country of engagement as well as the mission to be undertaken can change rapidly and abruptly. For example, operations can range from peace keeping operations to full war, from desert to urban city operations, as well as from national operations to multinational NATO missions. Furthermore, because military operations affect the well being of all those involved in and touched by the mission, as well as influencing both political and international relations, there is a demand that military organizations function at their best at all times.

In order to meet the demands of rapidly changing and unpredictable environments, organizational theorists have advocated that organizations need to be adaptable and flexible (Alberts & Hayes, 2003; Atkinson & Moffat, 2005; Englehardt & Simmons, 2002; Volberda, 1998). In fact, flexibility has been identified as a critical factor for organizational excellence for at least three decades (Bahrami, 1992; Krijnen, 1979; Morgan, 1997; Overholt, 1997; Snow, Miles, & Coleman, 1992; Volberda, 1998; Zammuto & O'Connor, 1992). A brief overview of the network organization literature, from both civilian and military contexts, reveals that flexibility is one of the most central tenants of organizational excellence.

### *Network organization*

By the 1980's, market changes along with new technological developments created both the need and opportunity for organizational change, giving the impetus for new types of organizations to emerge (Snow et al., 1992). Externally, organizations became more specialized and global, and internally the organizations' structures and

processes started to change. This new type of organization, coined ‘Network organization’, emerged by the early 1990’s as the focus of researchers both conceptually and empirically (Arnold, Cooper, & Robertson, 1998; Morgan, 1997; Snow et al., 1992). Snow et al. (1992) described the new network organizations as more dynamic, flexible and less dependent upon hierarchic structures and centralized controls typical of traditional organizations. Moreover, Morgan (1997) described network organizations as structurally flatter (less hierarchical) and more flexible than traditional organizations. Hence, civilian literature on network organization suggests both flat structure and decentralized processes are characteristics of flexible organizations.

#### *Military theory on network organization*

About a decade after researchers began to develop network theories within the context of civilian organizations, researchers began to use these ideas and insights as a theoretical foundation for defining and understanding what network organization would mean in national and multinational (e.g., NATO) military organizations (Alberts, Garstka, & Stein, 1999; Alberts, Garstka, Hayes, & Signori, 2001; Alberts & Hayes, 2003; Atkinson & Moffat, 2005). While the terms Network Centric Warfare (NCW) and Network Enabled Capabilities (NEC) have been employed by the US and UK respectively in their approaches, NATO Network Enabled Capabilities (NNEC) is the term currently employed by NATO for the collective NATO approach to the development of network enabled military organizations (e.g., Bartolomasi et al., 2005). Although the basic ideas from civilian network organization theories are recognizable in the military literature and statements such as, “NCW is about human and organizational behavior” (Alberts et al., 1999: p. 88) are not uncommon, there is a clear trend in the military literature, research, and organizations to focus mainly on the technological network. In fact, the military literature is rather superficial and anecdotal when it comes

to the human and organizational issues related to network theory. However, exploiting new technology may be dependent on organizational issues such as flexibility. For instance, Zammuto and O'Connor (1992) found flexibility to be linked to the successful implementation of new technology. They revealed that new technology was not adequately exploited in non-flexible organizations. This may be a crucial point insofar as much of the military network perspective is based on the implementation and use of new information and communication technologies. To do this successfully requires changes in the organization as well as in the technology. Flexibility may be the key organizational feature in order to fully realize and exploit the new technology. This suggests a need for research to focus on the organizational issues related to flexibility in military organizations. In line with the network literature, the term *flexibility* is presently defined as organizational flexibility, understood as the ability of the organization to adapt and respond successfully to the complex, unpredictable and changing demands of the environment (e.g., Hatum & Pettigrew, 2006).

#### *Research on the antecedents of flexibility*

##### *The flat structure - flexibility link*

Formalization, a classic feature of hierarchic organization, has been understood to providing an impediment to flexibility (e.g., Englehardt & Simmons, 2002; Volberda, 1999; Zammuto & Krakower, 1991). For example, when information must travel up and down the many levels of a hierarchy, the information becomes increasingly degraded for each level of processing that it passes through as well as the information sharing process itself becoming increasingly time consuming (Volberda, 1998). In turn, this will affect both the ability to make timely and good decisions as well as the ability to take action within the time slot available. These problems become exacerbated when the organization faces new challenges and the hierarchy becomes overloaded with greater



amounts of information flowing up and down all the levels in the hierarchy before a decision can be made and any action taken. Thus, theory indicates that hierarchic organizations are especially inflexible in situations of new tasks and high demand. In line with this, network theories postulate that flat structures provide the foundation for flexibility. While there is no lack of theoretical work on this issue, there has been a lack of empirical investigations from both civilian and military contexts into whether there really exists a positive relationship between flat structure and flexibility. The current research aims to start filling this gap in the research by testing whether flexibility can be predicted by flat structure in military teams and organizations, including also moderating factors (see below). Hence, it is suggested that (Hypothesis 1): flexibility can be predicted by flat structure in military teams and organizations. In this study, the term *structure (flat/hierarchy)* is defined as the degree to which an organization is considered to be flat as opposed to hierarchical, in terms of the number of levels in the organizational hierarchy (e.g., Volberda, 1998).

#### *The decentralized processes - flexibility link*

Liebeskind, Oliver, Zucker, and Brewer (1996) found, in their research of two new US biotechnology firms (sample of scientists and managers), that external social networks combined with a change in the internal organization, in terms of hierarchies shifting from a command and control mode to more of a support function, could increase the organizational flexibility. This change in the functioning of the hierarchies may be understood as a decentralization of organizational processes. Zammuto & Krakower (1991) made a similar link between decentralization and flexibility in a study of 334 universities and colleges in the US (sample of trustees, administrators and chairpersons). Other researchers have theoretically explained how decentralization of decision-making gives more flexibility to the organization (e.g., Englehardt & Simmons, 2002; Volberda,

1998). The work of Hatum & Pettigrew (2006), on the other hand, based on data collected from family businesses in the pharmaceutical and edible oil industries in Argentina (at the strategic level), suggests centralization rather than decentralization may increase the organization's flexibility.

In sum, even though most of the evidence speaks for a positive relationship between decentralized processes and flexibility, the results are somewhat inconclusive. The fact that the data in the research presented above was collected from different industries, countries, and at different hierarchical levels suggests that variations in the researched organizational populations may have contributed to the equivocal findings. Additionally, the proposed relationship has not been empirically tested in military contexts. Hence, there is a need to explore the flexibility-decentralized processes relationship in military contexts. The current research aims to test whether (Hypothesis 2): flexibility can be predicted by decentralized processes in military teams and organizations. In this study, *processes (decentralization/centralization)* is defined as the degree to which the organization processes are considered to be decentralized or centralized. The terms decentralized and centralized refer to the organizational processes rendered by the distribution of power and authority between the top and lower echelons of the organization. While organizational structure is understood to define the formal structure of the organization, organizational processes is understood to define how the structure is being implemented.

#### *Moderating factors*

The increasingly multinational nature of organizations also described in network organization theories (Alberts & Hayes, 2003; Atkinson & Moffat, 2005; Snow et al., 1992; Hatum & Pettigrew, 2006), suggests that multinationality and culture may be important issues to consider. Indeed, cultural factors at the national level may have

contributed to the equivocal results from research on the flexibility-decentralized processes relationship presented above. Both cultural differences as well as cultural diversity may be pertinent to the current research questions. In this study, culture is defined as national culture, concurring with the current scope and the field of cross-cultural psychology (e.g., Hofstede, 2001; House, Hanges, Javidan, Dorfman, & Gupta, 2004; Inglehart, Basáñez, Díez-Medrano, Halman, & Luijkx, 2004; Schwartz & Sagiv, 1995).

Power distance (Pd) is defined as “the extent to which the less powerful members of institutions and organizations within a country expect and accept power to be distributed unequally” (Hofstede, 1991: p. 28). Cultural differences in Pd influences whether people from different countries are used to and prefer to work in more hierarchic and centralized types of organizations or whether they conversely are used to and prefer to work in flatter and more decentralized types of organizations (e.g., Hofstede, 1991, 2001). Hence, it is suggested that (Hypothesis 3): Pd moderates the proposed relationships between flat structure and flexibility, and between decentralized processes and flexibility.

Flat structure and decentralized processes are proposed to promote flexibility. Additionally, flat structure and decentralized processes may contribute to the recognition of the added knowledge and viewpoints in a multinational team or organization. Philips and Thomas-Hunt (2007) proposed that a flatter structure increases the organization’s ability to take advantage of group diversity. Taking advantage of group diversity in terms of increasing the problem solving ability may confer increased flexibility. This suggests that (Hypothesis 4): cultural diversity interacts with the proposed relationships between flat structure and flexibility, and between decentralized processes and flexibility.

*The organizational context*

As suggested by the equivocal findings on the flexibility-decentralized processes relationship presented above, the organizational context may influence research results. This situation generates the question of whether also different military contexts will yield different results, that is, will any of the above proposed relationships turn out to be situation specific or will they have more general applicability in military contexts? Hence, we aim to test whether the results of hypotheses 1 through 3 reproduce across different military contexts.

## Method

*Design*

In order to explore the proposed organizational predictors of flexibility in different military contexts, including also moderators, surveys in three field settings and a quasi-experimental laboratory study were conducted. This design allows for the exploration of the variable relationships in different military organizational contexts - a triangulation of sources aiming to increase generalizability (e.g., Robson, 1993). Survey data collected from each study were used to determine the hypothesized relationships between structure, processes, Pd, and organizational flexibility. Additionally, the quasi-experimental study was designed to test the possibility of a moderating effect of cultural diversity.<sup>1</sup> The data from the four studies were first analysed separately, then conjunctively.

In all studies, the participants volunteered, and all information rendered was treated with confidentiality. Because the working language in both the experiment and

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<sup>1</sup> Because we depended on military academies for recruiting to this study, participants could not be randomly assigned to the experimental conditions, making the design quasi-experimental (e.g., Shadish, Cook, & Campbell, 2002). Participants in both conditions were, however, recruited from the same population (i.e., military academy).

the exercises was English, the questionnaires were presented in English to all participants.

### *Participants and data collection procedures*

#### *Study 1 (field study)*

In study 1, survey data was collected from the NATO Response Force (NRF) Allied Warrior exercise in 2004 (AW04). This represented a military headquarter (HQ) level context. Personnel at the Combined Joint Operations Center (CJOC) of the Deployed joint task Force (DJTF) HQ in AW04 were recruited for our study. Our respondents were from Denmark (1), Germany (2), Greece (3), Hungary (2), Italy (1), Turkey (1), the UK (8) and the USA (10), rendering a total of 28 respondents. This sample was predominantly military; 96 % of the respondents were military personnel (82 % officers, 18 % other ranks), and 4 % were civilian. 82 % were male and 18 % female. The respondents were recruited on the basis of information given at a brief during the exercise (28 represented a 100 % response rate of those who volunteered for the study, 31% of the DJTF personnel total). The data-collection was carried out at the DJTF towards the end of the AW04 exercise, in Verona, Italy. The exercise aim was to train and establish the readiness of the NATO response force (NRF). Activities in the DJTF were at the joint level (i.e. including all services: army, navy, and air force). It included pre-mission training, practicing crisis response planning procedures, and establishing the DJTF and command & control (C2) structure in a theatre of operations. The questionnaires were completed on site towards the end of the two-week exercise.

#### *Study 2 (field study)*

In study 2, survey data was collected from the NATO winter exercise Battle Griffin 2005 (BG05). This represented a military tactical level context. The sample consisted of 55 respondents (53 Norwegian, 2 Dutch) from a tactical level army unit in

the BG05 exercise. 55 represented a 60 % response rate. Due to missing values on two variables, two cases (both Norwegian) were deleted from the sample before analyses. This was a purely military sample (96 % officers, 6 % other ranks). 91 % were male and 9 % female. The survey data was collected in the last part of the BG05 exercise at a tactical level intelligence unit in Steinkjer, Norway. This unit represented a new organizational element charged with collecting, analyzing and distributing information during the exercise. This was a classic NATO winter exercise in cold weather conditions.

### *Study 3(field study)*

In study 3, survey data was collected from the fourth Multinational Experiment exercise (MNE4) in 2006. This represented a military headquarter (HQ) level context. The sample consisted of 156 participants in a NATO multinational coalition exercise (MNE4), 156 represented a response rate of 84 %. The respondents were from Canada (21), Denmark (23), Finland (7), France (13), Germany (6), Sweden (8), Turkey (23), UK (12), and the USA (43). In this sample, 71 % of the respondents were military personnel (100 % officers) and 29 % were civilian. 95 % were male and 5 % were female. The MNE4 was a three week long distributed collaborative exercise conducted within each participating nation and at a NATO headquarter. In this exercise, participants were presented with a hypothetical scenario and four vignettes that provided a focused look at selected aspects of a developing pre-crisis situation in a fictitious country. The task for the participants was to work together as a distributed coalition to halt a pre-crisis situation from developing into a war by identifying and assessing a variety of both military and non-military interventions. At the end of the exercise, net-based questionnaires were distributed to all participants in the exercise.

### *The characteristics of studies 1-3*

The descriptions of the studies above indicate that there were three different types of organizations in three different settings and at three different points in time. In study 1, the organization was an HQ (operational level) at a regular NATO exercise, multinational in nature and including all services. In study 2, the organization was at a lower hierarchical level (tactical), hence focusing more on specialized tasks, and being more homogenously composed in terms of the personnel's nationality and representation of services (all army personnel). For study 3, the organization was akin to the first study as it pertained to an HQ level, with the addition that study 3 included not only the different services, but a civilian component as well. In this exercise, the collaboration was also more distributed than in the first two.

*Study 4 (laboratory study)*

The data for study 4, was collected from military officers participating in the experimental series in 2006-2007, employing a computer game environment of a simulated weapons search mission (i.e., SABRE: Warren, Diller, Leung, Ferguson, & Sutton, 2006). A total of 32 experimental game sessions were conducted, each with a team of four participants. Cultural diversity represented the experimental manipulation; 24 teams had a culturally homogeneous composition and 8 teams had a culturally diverse composition. The four participants in each culturally diverse team were randomly chosen from the five participating countries.

The participants were military officers from Bulgaria (6), the Netherlands (20), Norway (62), Sweden (6), and the USA (34). Nationalities included were understood to be culturally different on several dimensions, as indicated by cross-cultural research (e.g., Hofstede, 2001; Hoppe, 1990; House et al., 2004; Inglehart, et al., 2004; Schwartz & Sagiv, 1995; Soeters, 1997). 97 % of the participants were male, and 3 % were female.

There was a total sample size of  $N = 128$  at the individual level and  $N = 32$  at the group level.

In the game scenario, the participants were in a team whose task was to find caches of weapons in a modern urban environment. Team points were accrued by finding the hidden weapons. In order to do their mission, the participants had a set of tools in the game to help them out. These tools were scarce, to promote cooperation between the players. The team members needed to assemble, share and analyze information in order to solve the problems and make decisions about how to find the hidden weapons. There was no predetermined way in which the participants should solve their tasks, neither in the way they decided to use the information they either sought or were given, nor in how they organized. The latter point indicates how the game lends itself to the study of variations in organization. In sum, the mission and experimental group tasks were complex. Using the classification of Hambrick Davison, Snell, and Snow (1998), the tasks can be classified as a hybrid of coordinative, computational and creative tasks. Communication between the players was done through a chat function; there was no voice or other modes of communication. One common language, English, was used for all communication. Computerized survey questions followed at the end of the game sessions.

At the beginning of each session, the participants were assigned to a computer and then began a game learning session. One person in each team was randomly assigned to be the team leader. At the conclusion of the learning session, the experimental game session started - timed to exactly 1 hour.

#### *Measures of organizational structure, processes, and flexibility*

In studies 1-3 (field studies), each of the structure, processes, and flexibility variables were assessed using a one-item five-point bipolar measurement scale. The



*structure (flat/hierarchy)* variable was assessed by asking the participants to rate the degree to which they perceived the current organization as hierarchical or flat in comparison to the organization where they normally worked. Response choices ranged from “much more hierarchic” to “much flatter”. The *processes (decentralization/centralization)* variable was assessed by asking the participants to rate the degree to which they perceived the current organization as centralized or decentralized in comparison to the organization where they normally worked. Response choices ranged from “much more centralized” to “much more decentralized”. The *flexibility* variable was assessed by asking the participants to rate the degree to which they perceived the current organization as rigid or flexible in comparison to the organization where they normally worked. Response choices ranged from “much less flexible” to “much more flexible”. An additional questionnaire item was included to assess whether there overall existed any perceived differences in organization in the field studies in comparison to the organization where they normally worked. This was a general item, added to check for the overall perception of change, intended to indicate whether the more specific questions on structure, processes, and flexibility were justified. The participants were asked to rate the degree of differences between the exercise organization and their home organization using a three-point scale that ranged from “yes, very different” to “no, no difference”.

In study 4 (laboratory study), each of the structure, processes, and flexibility variables were assessed using a similar one-item 5-point bipolar measurement scale as in the field studies. However, the assessments in the laboratory study were phrased in a non-comparative manner. The *structure (flat/hierarchy)* variable was assessed by asking the participants to rate the degree to which they perceived the organization as hierarchical or flat. Response choices ranged from “very hierarchic” to “very flat”. The

*processes (decentralization/centralization)* variable was assessed by asking the participants to rate the degree to which they perceived the organization as centralized or decentralized. Response choices ranged from “very centralized” to “very decentralized”. The *flexibility* variable was assessed by asking the participants to rate the degree to which they perceived the organization as rigid or flexible. Response choices ranged from “very rigid” to “very flexible”.

The use of different bipolar descriptive scales instead of the more common Likert type scales with identical response denominators (agree/disagree), aimed to lessen the risk of common method bias (e.g., Bergkvist & Rossiter, 2007) and to retrieve the same information by posing one instead of two questions. The structure, processes, and flexibility measures were developed in-house. The developments were based on previous theory and research (e.g., Alberts et al., 1999; Zammuto & Krakower, 1991) and earlier exploratory studies (e.g., Bjørnstad, 2002). The content validity of the items was established through peer-reviews, supplemented by semistructured pre-interviews (13) conducted with target raters on-site at the first study. The latter further served to tighten the questionnaire in terms of inadequate items being removed. The univariate characteristics (*M* and *SD*) of all items included in the current study are presented in Tables 1 and 3.

### *Moderators*

Based on information about participants’ nationalities, Hofstede’s country index scores on *Pd* were employed in the analyses (Hofstede, 1991, 2001). *Cultural diversity* was operationalized as whether the organizations or teams were composed of single or multiple nationalities. In study 4, this represented the experimental manipulation. In study 1 and 3, the organizations were multinationally composed whereas the study 2

organization was nationally composed. Cultural diversity was dummy coded (1 = national composition, 2 = multinational composition).

### *Statistical analyses*

In order to examine the relationships between the variables structure, processes, Pd, cultural diversity, and flexibility, correlation analyses were first conducted separately for each of the studies. The results of these analyses, including the means and standard deviations are presented in Tables 1 (studies 1-3) and 3 (study 4). Subsequently, hierarchical regression analyses were performed separately for each study in order to estimate moderator effects and the variables' unique relationships to flexibility. First, a regression model with only the independent variables, structure and processes, as predictors of the dependent variable (flexibility), was estimated (step 1). Next, Pd and cultural diversity were entered into the model (step 2), hence estimating all main effects. Finally, the interaction terms between Pd and structure and processes (step 3) and between cultural diversity and structure and processes were included in the model (step 4) (Tables 2 [studies 1-3] and 4 [study 4]). A significant increase in the amount of explained variance ( $R^2$ ) after including the interaction terms indicates that the model is improved and hence that moderating effects are present. To avoid issues of multicollinearity and to aid the interpretation of the results, all independent variables were mean centered before being entered into the regression analyses. Finally, to calculate average estimates for all the studies, the individual level data from all four studies were collapsed into one file and reanalyzed (Figure 1).

## Results

### *Study 1-3 (field studies)*

The analysis demonstrated that 86 % of the respondents from study 1, 71 % of the respondents from study 2, and 92 % of the respondents from study 3 reported that the

exercise organization that they were working in was to some degree different from the organization where they worked on a daily basis. This finding indicated that the subsequent items on the perceived differences in organizational structure, processes and flexibility in the field studies were justified.

#### *Study 1 (field study)*

In study 1, the correlation analysis indicated a statistically nonsignificant relationship between the independent variables, structure (flat/hierarchy) and processes (decentralized/centralized) ( $p = .430$ ). The regression analysis revealed a statistically nonsignificant relationship between flat structure and the dependent variable, flexibility, yet showed a significant relationship between decentralized processes and flexibility, explaining 45 % of the variance in the flexibility ratings. The latter finding indicates that when the exercise organization was perceived as more decentralized compared with the respondents' previous experience, the exercise organization simultaneously tended to be perceived as more flexible. The results further show that Pd neither had a significant main effect on flexibility, nor any moderator effects on the flat structure-flexibility and decentralized processes-flexibility paths. The results are presented in Tables 1 and 2.

Insert Table 1 about here.

Insert Table 2 about here.

#### *Study 2 (field study)*

In study 2, the correlation analysis also revealed a statistically nonsignificant relationship between the independent variables, structure (flat/hierarchy) and processes (decentralized/centralized) ( $p = .134$ ). The regression analysis revealed statistically significant relationships both between flat structure and flexibility, and between decentralized processes and flexibility. This result indicate that when the exercise organization was rated flatter and more decentralized than the home organization, the

exercise organization was also rated as more flexible than the home organizations of the participants. Flat structure and decentralized processes explained 26 % of the variance in the flexibility ratings. The results are presented in Tables 1 and 2.

### *Study 3 (field study)*

In study 3, the correlation analysis showed a statistically significant relationship between the independent variables, structure (flat/hierarchy) and processes (decentralized/centralized). The regression analysis revealed statistically significant relationships both between flat structure and flexibility, and between decentralized processes and flexibility. These results were consistent with study 2 insofar as the participants who rated the exercise organization as flatter and more decentralized than their home organization tended to rate the exercise organization as more flexible than their home organization, which accounted for 24 % of the variance in flexibility. The results further show that Pd neither had significant main effect on flexibility, nor any moderator effects on the flat structure-flexibility and decentralized processes-flexibility paths. The results are presented in Tables 1 and 2.

### *Study 4 (laboratory study)*

The laboratory study data allowed for analyses to be conducted at both individual and group levels. For the group level analysis, aggregated mean scores were computed for each of the variables. In line with suggestions for using aggregated scores (e.g., Rousseau, 1985), within group agreement for the dependent and independent variables was estimated using the  $r_{WG}$  coefficient. The structure ratings had an  $r_{WG}$  of .58, the processes ratings had an  $r_{WG}$  of .61, and the flexibility ratings had an  $r_{WG}$  of .70, suggesting a moderate degree of within group agreement of ratings (LeBreton & Senter,

2007).<sup>2</sup> For our purposes, a moderate agreement was considered adequate for analyzing the data at the group level (for a discussion, see LeBreton & Senter, 2007). Although some may consider the  $r_{WG}$  values to be somewhat low, our purposes did not depend on the participants having a very similar perception of the organization. Indeed, as previous organizational experiences necessarily vary within the group and affect the current individual perceptions of the organization, there will have to be some within group variance. The sum of the perceptions at the group level may still be just as informative.

#### *Individual level analyses*

The correlation analysis indicated that the independent variables, structure (flat/hierarchy) and processes (decentralized/centralized) were significantly related. The results of the regression analysis revealed that their relationships to the dependent variable, flexibility, were in the expected direction. Although none of the two independent variables were significantly related to flexibility at the 5 % level, the amount of variance in flexibility accounted for by the two variables collectively ( $R^2 = .07$ ) was significantly different from zero, supporting the inclusion of both flat structure and decentralized processes as predictors of flexibility. A probable explanation for the lack of statistical significance at the 5 % level associated with each individual predictor is the relatively strong correlation between the two predictors. The moderator analyses revealed that neither Pd nor cultural diversity moderated the effects of structure and processes on flexibility. No significant main effects of Pd and cultural diversity were found either, although the latter was almost significant. The results are presented in Tables 3 and 4.

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<sup>2</sup> Calculating the within group agreement for the moderators was not justified for the following reasons. In terms of cultural diversity, the groups were either culturally diverse or culturally homogeneous. Similarly, there would be perfect within group agreement in Pd in the culturally homogeneous groups, although very little within group agreement in Pd in the culturally diverse groups, where the within group agreement would be low per definition.

Insert Table 3 about here

Insert Table 4 about here

### *Group level analyses*

The results from the correlation and regression analyses based on the aggregated averaged scores at the group level ( $N = 32$ ) were similar to the results obtained using the data from the individual level responses: the independent variables were significantly related, while their ability to predict flexibility was not significant. Moreover, the relationships between flat structure and flexibility and between decentralized processes and flexibility were observed to be a bit stronger, although further from significance in comparison with the individual level analysis ( $p = .334$ ,  $p = .298$ , respectively). Although the variables flat structure and decentralization explained 14 % of the variance in flexibility at the group level, the variance accounted for was not significantly different from zero at this level of analysis ( $p = .105$ ). The moderator analyses revealed that neither Pd nor cultural diversity moderated the effects of structure and processes on flexibility. There were also no significant main effects of Pd and cultural diversity, although the latter was not far from significant ( $p = .108$ ). The results are presented in Tables 3 and 4.

### *Conjunctive analysis of the data from all four studies*

As observed in the previous analyses, the relationships between ratings of structure, processes and flexibility were in the same direction in both the field studies and in the laboratory study (the only exemption being the very weak and nonsignificant relation between ratings of structure and flexibility in study 1). This permitted that the data from all studies were analyzed together; new regression and correlation analyses were conducted to calculate the average values of the relationships between the variables. The significant coefficients are presented in the model in Figure 1, showing

that perceptions of flat structure, decentralized processes, and cultural diversity predict organizational flexibility, explaining 24 % of the variance in flexibility. Although cultural diversity showed a significant, negative main effect on flexibility, no significant moderator effects were found.

Insert Figure 1 about here

## Discussion

The results from the four studies, analyzed both separately and conjunctively, lend support to Hypotheses 1 and 2, which proposed that an organization's flexibility can be predicted by flat structure and decentralized processes. The relationship between decentralization and flexibility was the strongest and most consistent relationship observed (Hypothesis 2). Moreover, in three out of four studies (studies 1-3), decentralization was found to predict flexibility. Flat structure was found to predict flexibility (Hypothesis 1) in two out of four studies (studies 2 & 3). While there were no significant separate effects of the dependent variables (i.e., flat structure and decentralization) in the laboratory study (study 4), there was a significant collective effect (i.e., the regression model including both dependent variables and flexibility was significant) - interpreted to be due to the relatively high intercorrelation between the independent variables. In the laboratory study, the same trend in the data was observed also at the group level of analysis, suggesting the same relationships at both levels of analysis.

The moderating analyses revealed no effects from Pd on the flat structure-flexibility and the decentralization-flexibility relationships suggested in Hypothesis 3. This was found both when analysing the studies separately and together. Hence, contrary to expectations based on cross-cultural studies (e.g., Hofstede, 2001) Pd was not found to influence the current results. Similarly, cultural diversity demonstrated no moderating



effects on the flat structure-flexibility and the decentralization-flexibility relationships, which had been expected based on the theories of Philips and Thomas-Hunt (2007) (Hypothesis 4). There was, however, a negative main effect of cultural diversity on flexibility when analyzing all the studies together. The latter finding suggests that the organizations have not managed to take advantage of the cultural diversity in the organizations studied. Despite the increased problem solving potential of diverse teams, coordination issues and process loss are, however, well known challenges (Mannix & Neale, 2005).

#### *Implications and future research*

If it is indeed the case that the interconnections between the perceptions of the organizations' structure, processes, and flexibility measured in this study reflect the interconnections between these organizational variables at a more objective level, then the collective findings of this study based on both field and laboratory empirical data from international military contexts, give empirical support to two of the most basic hypotheses of both civilian and military network theories – that flatter organizational structures and decentralization will lead to greater flexibility (e.g., Alberts & Hayes, 2003; Arnold et al., 1998; Galbraith, 2002; Volberda, 1998; Zammuto & Krakower, 1991).

However, it appears that decentralization is a relatively more important variable for achieving organizational flexibility than the issue of flattening hierarchies and might even constitute a prerequisite for flexibility. The reason suggested in military network theories (e.g., Alberts & Hayes, 2003; Roman, 1997), is that decentralization empowers lower organizational echelons to respond to local conditions as well as making information more available in order for them to make qualified decisions. Such co-location of the decision-making and executing parts of the organization, will make the

organization able to respond swiftly and adaptable in line with the current demands of the situation. Furthermore, the decentralization also makes an increased number of individuals in the organization more used to, and hence also more able to, assemble the information needed, assess the situation, and make the decisions. This gives the organization increased flexibility in that more people have the ability and know-how to step up when the situation calls for it. Conversely, when only a few central persons have this ability, the constraints on the range of possible ways to respond increase, both from an organizational and a situational point of view. Additionally, having to wait for centralized decisions when circumstances change abruptly can obstruct the possibility for adaptive responses – both in kind and time. Ironically, organizational development in many military organizations in the network enabled capabilities era does not reflect a conscientious approach to such issues; rather than a decentralization of processes there has been a centralization in many military operational organizations (Bolia, Vidulich, Nelson, & Cook, 2003; Roberts & Smith, 2003; Vego, 2003). The current study results suggest that this trend may have negative implications for the organizations' ability to achieve flexibility.

Although there was not found any empirical support for the proposed moderating effects of Pd and cultural diversity, the analyses revealed a direct negative effect of cultural diversity on flexibility. The dynamic behind this effect could not be uncovered in the current study. Hence, it is suggested that future research investigate the effects of cultural diversity in military contexts, especially focusing on moderating and mediating factors. Increasing this knowledge may aid military organizations towards taking better advantage of the potential in multinational organizations.

#### *Methodological issues*

These results are based on participant perceptions. Using participants' subjective perceptions in order to make inferences about an organization's characteristics is a common approach in organizational research, and research has indicated the usability of self-report measures to describe organizational phenomena (Patterson et al., 2005; Spector, 1994). The collective reality of an organization may be understood as the sum of the realities perceived by its participants (e.g., Patterson et al., 2005). As such, measuring the participants' perceptions of organizational structure, processes, and flexibility provide insights into the relationships between the variables of interest in this study.

The interpretation that decentralization and flat structure *predict* flexibility, should be made cautiously because the present study relies on cross-sectional data and as such the observed relationships do not necessarily reflect causal relationships. The theoretical and empirical research that this study is founded upon nevertheless supports this interpretation of the analyses (see Alberts & Hayes, 2003; Arnold et al., 1998; Englehardt & Simmons, 2002; Galbraith, 2002; Kvande, 2007; Volberda, 1998; Zammuto & Krakower, 1991).

Some might argue that the single-item type measures of processes (decentralization/centralization), structure (flat/hierarchy) and flexibility is a weakness in this study. As indicated by Gosling, Rentfrow, and Swann (2003), single-item scales have most often been found less reliable and valid than multi-item scales, at least when measuring underlying psychological constructs, such as personality. This potential weakness is, however, less problematic when it comes to the measurement of less obscure constructs, such as the perception of organizational phenomena, where single-item measures sometimes have been deemed the preferable type of measure (Rossiter, 2002). Single-item scales have the advantages of minimizing item redundancy, time for

completion, and participant fatigue (Gardner, Cummings, Dunham, & Pierce, 1998) – all central concerns in the present study. Wanous, Reichers, and Hudy (1997) successfully tested and employed a single-item measure of job satisfaction, leading to the conclusion that the use of single-item measures should not be considered a fatal flaw. More recent research has also demonstrated the usability of single-item measures in studies of student ratings of teaching effectiveness, marketing, perception of task difficulty, and group norm and ingroup identification (Bergkvist & Rossiter, 2007; Jimmieson, Peach, & White, 2008; Li, Lee, & Solomon, 2007; Wanous & Hudy, 2001).

The present research cross-validated the same variable relationships in four different samples and organizational contexts, including also a slight difference in the tools of measurement used in the field and laboratory settings. These factors add strength to the findings in terms of replicability and generalizability.

#### *Levels issues*

The field studies measured the participants' perceptions of differences in structure, processes, and flexibility in their current exercise organization in comparison to the structure, processes, and flexibility of the organization where they normally worked. The primary focus in these studies was how the perceived differences compared with their normal experience were interconnected; would such differences in structure and process predict differences in flexibility? The measurements in the field studies were thus explicitly relative to each participant's prior organizational experiences. This becomes an advantage when researching the relationships between the variables. As each individual evaluation is explicitly relative to their normal organizational setting, the analysis of a relationship between these variables will be relative to the functioning of many organizations, and not simply a reflection of the way many individuals perceive the one exercise organization. This suggests that findings may

be understood also at an organizational level. Results from the laboratory study support this interpretation; although the relationships with flexibility were not significant, there was an agreement in results between the group and individual levels of analysis. This addresses the critique put forth by Schnake & Dumler (2003) stating that the traditional one-level focus in organizational research has had the negative effect of preventing the development of models with cross-level validity.

### Conclusion

This study demonstrated that both perceived flat organizational structure and decentralized processes predicted perceived organizational flexibility as proposed by military and civilian network organization theories. This was particularly true for the issue of decentralization. Analysed collectively, the data revealed significant relationships both between decentralization and flexibility and between flat structure and flexibility. This indicates that decentralizing processes as well as flattening the hierarchy may contribute towards achieving higher levels of organizational flexibility in military organizations. Thus, an important implication for obtaining more flexible military organizations than currently exist would be to focus on organizational changes in terms of structure and processes.

Although there was not found any empirical support for the proposed moderating effects of Pd and cultural diversity, there was revealed direct negative effect of cultural diversity on flexibility. This result suggested more research is needed on cultural diversity in military teams and organizations.

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## Tables

*Table 1. Means, standard deviations and zero-order correlation coefficients, calculated separately for studies 1-3 (study 1,  $N = 28$ ; study 2,  $N = 53$ ; study 3,  $N = 156$ ).*

	<i>M (SD)</i>			<i>1</i>			<i>2</i>			<i>3</i>		
	Study 1	Study 2	Study 3	Study 1	Study 2	Study 3	Study 1	Study 2	Study 3	Study 1	Study 2	Study 3
1. Structure (flat/hierarchy)	3.36 (1.16)	2.58 (0.97)	3.24 (1.11)									
2. Processes (centr./decentr.)	2.82 (1.19)	2.68 (1.07)	3.24 (1.15)	.155	.206	.418***						
3. Flexibility	3.04 (1.17)	2.98 (1.12)	3.01 (1.15)	.045	.383**	.457***	.671***	.429**	.360***			
4. Pd	41.48 (9.96)	31.26 (1.40)	43.94 (12.49)	-.257	—	.110	-.258	—	.027	-.017	—	.041
5. Cult. diversity	2.00 (.00)	1.00 (.00)	2.00 (.00)	—	—	—	—	—	—	—	—	—

Note. All variables have a scale from 1-5 (high scores = flat structure, decentralized processes, and high flexibility). Because the field studies were either from a culturally diverse context only (study 1 and 3), or a culturally homogeneous context only (study 2), the effects of cultural diversity could not be calculated separately for the field studies. Also, because the study 2 sample was culturally homogeneous the effects of Pd could not be calculated separately for study 2 (this is marked with a dash [—] in the table).

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

*Table 2. Flexibility (dependent variable) predicted by flat structure, decentralized processes, and power distance (moderator 1). Hierarchical regression analyses. Standardized regression coefficients calculated separately for studies 1-3.*

	Step 1 (Main effects IV)			Step 2 (+ Pd)		Step 3 (+ Interaction 1)	
	Study 1	Study 2	Study 3	Study 1	Study 3	Study 1	Study 3
Structure (flat/hierarchy)	-.061	.292*	.372***	-.025	.372***	-.026	.372***
Processes (decentralized/centralized)	.680***	.354**	.204**	.716***	.204**	.729***	.218**
Power distance (Pd)				.161	-.006	.146	-.009
Pd x Structure						-.096	.027
Pd x Processes						.021	.076
$R^2$	.45***	.26***	.24***	.48***	.24***	.48**	.25***
$\Delta R^2$				.03	.00	.00	.00

Note. Because the field studies were either from a culturally diverse context only (study 1 and 3), or a culturally homogeneous context only (study 2), the effects of cultural diversity (moderator 2) could not be calculated separately for the field studies. Also, because the study 2 sample was culturally homogeneous the effects of Pd could not be calculated separately for study 2.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

*Table 3. Means, standard deviations and zero-order correlation coefficients from study 4, calculated separately at the individual level (N = 128) and at the group level (N = 32).*

	<i>M (SD)</i>		1		2		3		4	
	Ind. level	Gr. level	Ind. level	Gr. level	Ind. level	Gr. level	Ind. level	Gr. level	Ind. level	Gr. level
1. Structure (flat/hierarchy)	3.34 (1.05)	3.34 (0.69)								
2. Processes (centr./decentr.)	3.59 (1.05)	3.59 (0.71)	.442***	.571**						
3. Flexibility	3.66 (0.87)	3.66 (0.52)	.221*	.332	.238**	.339				
4. Pd	36.27 (8.53)	36.27 (5.29)	-.001	.083	-.042	-.101	-.035	-.091		
5. Cult. diversity	1.25 (0.43)	1.25 (0.44)	.086	.132	-.035	-.051	-.151	-.256	.373***	.608***

Note. All variables have a scale from 1-5 (high scores = flat structure, decentralized processes, and high flexibility).

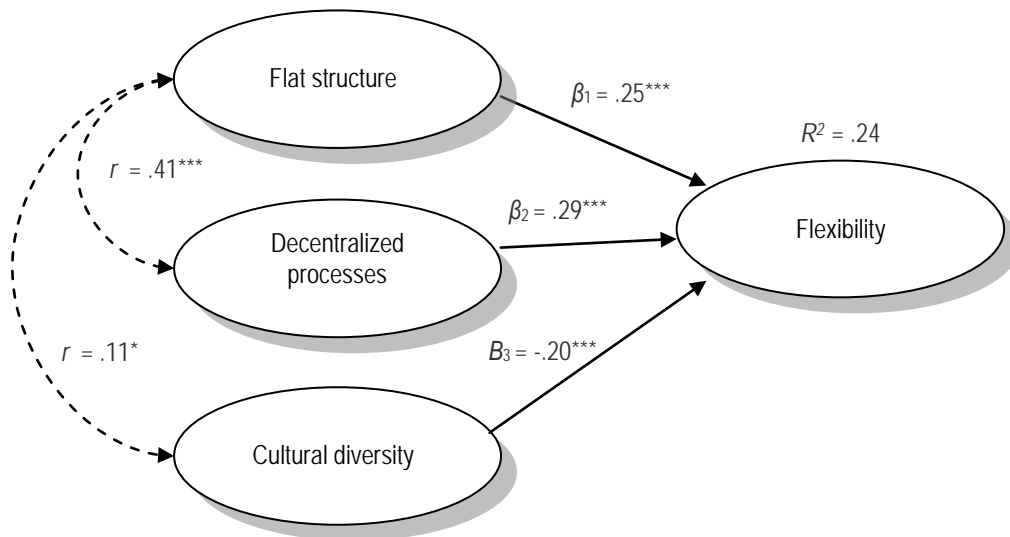
\* $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

*Table 4. Flexibility (dependent variable) predicted by flat structure, decentralization, power distance (moderator 1), and cultural diversity (moderator 2). Hierarchical regression analyses. Standardized regression coefficients from study 4, calculated separately at the individual and group levels of analysis.*

	Step 1 (Main effects IV)		Step 2 (+ Pd and diversity)		Step 3 (+ Interaction 1)		Step 4 (+ Interaction 2)	
	Ind. level	Gr. level	Ind. level	Gr. level	Ind. level	Gr. level	Ind. level	Gr. level
Structure (flat/hierarchy)	.144	.206	.165 <sup>†</sup>	.266	.149	.292	.142	.073
Processes (decentralized/centralized)	.174 <sup>†</sup>	.222	.160 <sup>†</sup>	.181	.170 <sup>†</sup>	.184	.171 <sup>†</sup>	.264
Power distance (Pd)			.042	.121	.042	.113	.050	.144
Cultural diversity			-.177 <sup>†</sup>	-.356	-.177 <sup>†</sup>	-.378	-.186 <sup>†</sup>	-.444 <sup>†</sup>
Pd x Structure					-.113	.064	-.137	-.362
Pd x Processes					.025	-.118	.005	-.092
Cult. diversity x Structure							.062	.491
Cult. diversity x Processes							.075	-.016
$R^2$	.07**	.14	.10*	.23	.11*	.24	.12*	.29
$\Delta R^2$			.03	.09	.01	.01	.01	.05

<sup>†</sup> $p \leq .10$ . \* $p < .05$ . \*\* $p < .01$ .

## Figures



$N = 365$ . \*\*  $p < .001$ . \*\*\*  $p < .001$ .

*Figure 1. Model predicting flexibility by the variables structure (flat/hierarchy), processes (decentralized/centralized), and cultural diversity. Correlation and standardized regression coefficients are based on data from all four studies.*



## EFFECTS OF NETWORK ORGANIZATION

Exploring network organization in military contexts – effects of flatter structure and more decentralized processes

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### Abstract

Changes in the tasks and responsibilities of military organizations in recent decades have prompted new organizational solutions collectively known as network organization. Network organization includes changes to central organizational variables such as structure and processes. The present study explores potential effects of such changes in military contexts – that is, of flattening structure, decentralizing processes, aligning structure and processes, and increasing flexibility. To this end, self-report data were collected in three different military exercise organizations. Results indicate that perceptions of flat structure and decentralized processes both predict organizational effectiveness with almost full mediation by flexibility. No conclusions were drawn pertaining to the direct and moderating effects of alignment. Interpretations and implications for the implementation of network organizational changes in military contexts are discussed.

*Keywords:* Network organization, effectiveness, flat structure, decentralized processes, alignment, flexibility.

Military organizations have experienced great changes in their tasks and responsibilities in recent decades. Cold war predictability has been replaced by rapidly changing and increasingly complex tasks and environments. These challenges call for changes to traditional military organizational structures and processes (e.g., Alberts & Hayes, 2003). At the same time, developments in information and communication technologies have created new opportunities for collaboration and information sharing, improving the possibilities for more efficient organizational structures and processes (e.g., Alberts & Hayes, 2003; Atkinson & Moffat, 2005; Volberda, 1998).

### *Network organization*

Network organization has been proposed as a solution to address the changes and new challenges in both civilian and military contexts. The ideas and organizational designs associated with network organization emerged in the civilian sector during the 1980s. Their introduction was mainly a result of market changes alongside new technology developments (e.g., Snow, Miles & Coleman, 1992; DeSanctis & Poole, 1997; Tiernan et al., 2002). By the beginning of the twenty-first century, a military approach to network organization emerged (e.g., Alberts, Garstka, & Stein, 1999; Alberts & Hayes, 2003; Atkinson & Moffat, 2005).

Common to both the civilian and military approaches to network organization is the understanding that network organization represents a move away from traditional bureaucratic types of organization, with a hierarchical structure and centralized, stove-piped authority and decision-making processes, in favor of flatter, more decentralized and flexible types of organization (e.g., Alberts & Hayes, 2003; Atkinson & Moffat, 2005; DeSanctis & Poole, 1997; Snow et al., 1992). Network organization is expected to promote both more adaptable and efficient organizations (e.g., Alberts & Hayes, 2003). Many military organizations, NATO

included, are currently planning for changes to bring military organizations toward network enabled capabilities (e.g., NATO Network Enabled Capabilities (NNEC); Bartolomasi, et al., 2005). The trend within military organizations to focus mainly on technological networks (e.g., Bartolomasi, et al., 2005) indicates a need for research that focuses on organizational issues.

### *Flat structure*

Formalization, a classic feature of hierarchical organization, has been argued to impede flexibility (e.g., Englehardt & Simmons, 2002; Volberda, 1999; Zammuto & Krakower, 1991). For example, when information must travel through the many levels of a hierarchy, the information becomes increasingly degraded with each level through which it must pass. At the same time, the information-sharing process becomes increasingly time-consuming (Volberda, 1998). In turn, such inefficient processes will affect both the ability to make timely and appropriate decisions and the ability to take action within the time available. This problem is exacerbated when the organization faces new challenges. Volberda (1998) argues, in line with military network theories (e.g., Alberts & Hayes, 2003), that flatter structures provide the foundation for flexibility and faster decision-making procedures. These contentions remain theoretical, however, as little has been done to test them empirically. Hence, it is proposed that (Hypothesis 1): flat organizational structure will influence flexibility and effectiveness positively in military organizations.

In this study, structure (flat/hierarchy) is operationalized as the degree to which the organization is perceived to be flat (as opposed to hierarchical) (e.g., Volberda, 1998). In line with the suggestions of Kozlowski & Ilgen (2005), effectiveness is operationalized as key team processes (i.e., information sharing, decision making, and organization rating) that have been shown to affect organizational output (e.g., Benbasat & Lim, 1993; Campion, Medsker &

Higgs, 1993; Khanna & New, 2008; Mesmer-Magnus & DeChurch, 2009; Tiernan, Flood, Murphy, & Carrol, 2002). The centrality of information quality and amount in military network theories (e.g., Alberts et al., 1999) further motivated the operationalization of information sharing as the perceived quality and amount of information shared. Reflecting commonly used measures of effectiveness (e.g., Benbasat & Lim, 1993; Khanna & New, 2008), decision making is operationalized as the perceived timeliness, quality, and success of decisions. In accordance with past studies (e.g., Khanna & New, 2008; Tiernan et al., 2002) personnel evaluations of the organization represents the operationalization of organizational rating. Finally, based on previous research (e.g., Dennis, 1996), it is expected that the effectiveness measures may be internally related, in terms of information sharing partly mediating some of the effects on decision making and organization rating.

#### *Decentralized processes*

Another central feature of network organization is the distribution of power and authority to the lower echelons of the organizational hierarchy (e.g., Alberts & Hayes, 2003; Atkinson & Moffat, 2005; Snow et al., 1992), enabling decentralized processes (e.g., Sheremata, 2000). Decentralization means shorter information-sharing and decision-making loops (e.g., Roman, 1997), and an increased number of individuals who are able to make decisions (e.g., Alberts & Hayes, 2003; Galbraith, 2002). This line of reasoning suggests that decentralized processes enhance both the speed and capacity of the organization to handle large numbers of simultaneous tasks in a dynamic environment, understood to be crucial to achieving flexibility (e.g., Alberts & Hayes, 2003; Englehardt & Simmons, 2002; Galbraith, 2002; Volberda, 1998). Empirical investigations of the link between decentralization and flexibility are sparse from military contexts, whilst equivocal findings have been demonstrated from different civilian contexts (e.g.,

Hatum & Pettigrew, 2006; Zammuto & Krakower, 1991). The present research endeavors to research this issue, and proposes that (Hypothesis 2): decentralized processes will influence flexibility and effectiveness positively in military organizations. In this study, processes (decentralization/centralization) is operationalized as the degree to which the organizational processes are perceived as decentralized or centralized by its members.

### *Flexibility*

Flexibility is a central part of network theories, expected to enable increased information sharing and collaboration across hierarchies and services, facilitating high-quality, timely decisions and responses as well as operational efficiency (e.g., Alberts & Hayes, 2003). Although flexibility has been found to increase effectiveness in empirical research (e.g., Campion, et al., 1993; Patterson, et al., 2005), such research is lacking from a military context. From this, it is suggested that (Hypothesis 3): flexibility partially mediates the hypothesized relationships between structure and effectiveness, and between processes and effectiveness. In this study, flexibility is operationalized as the perceived ability of the organization to respond adaptively to the demands of the environment (Hatum & Pettigrew, 2006).

### *Alignment of structure and processes*

Many organizational theories (e.g., Galbraith, 2002; Kotter, 1978) have suggested that alignment of core organizational variables is central to an organization's effectiveness. This view implies that if a fit between variables such as structure and processes is not ensured in organizational development, the organizational changes implemented could result in a decrease rather than an increase in effectiveness. For instance, if the structure is changed from hierarchical to flat at the same time as the decision-making authority is centralized at the top end, the decision-making load on the top management is liable to become too heavy and render the

organization inefficient. This has been exemplified in studies of both civilian (Kvande, 2007) and operational military (Vego, 2003) organizations, suggesting that alignment of structure and processes may influence the effects of structure and processes. Unless controlled for, a lack of alignment would make it difficult to decipher which organizational solutions may be most advantageous. Hence, it is proposed that (Hypothesis 4): alignment between structure and processes moderates the effects of flat structure and decentralized processes, as well as having direct effects on flexibility and effectiveness. Alignment is in this study operationalized as the congruence between structure and processes. The conceptual model of the hypotheses is presented in Figure 1.

[Insert Figure 1 about here.]

## Method

### *Participants and procedures*

Survey data were collected from three different military exercise organizations at three different points in time: the Allied Warrior (AW04) exercise in 2004 (study 1), the Battle Griffin (BG05) in 2005 (study 2), and the fourth Multinational Experiment exercise (MNE4) in 2006 (study 3). The purpose of the AW04 was to exercise and establish the readiness of the NATO Response Force (NRF), the BG05 purpose was to train NATO forces in extreme cold weather conditions, and the MNE4 purpose was to train NATO multinational coalition and civilian-military collaboration. Personnel at the Combined Joint Operations Center (CJOC) of the Deployed Joint Task Force (DJTF) Head Quarter (HQ) in AW04 was chosen for study 1 as the organizational unit had been changed according to new demands for a more effective organization. A tactical-level army unit in BG05 was chosen for study 2 because this unit represented a new organizational element, aiming to increase organizational effectiveness. The MNE4 exercise organization was chosen for study 3 based on its focus on effectiveness in



coalition and military-civilian collaboration. The AW04 was a command post exercise (CPX, i.e., run by an exercise command), where the activities in the DJTF included pre-mission training, practicing crisis response planning procedures, and establishing the DJTF and command & control (C2) structure in a theatre of operations. The scenario in BG05 included ethical conflicts and asymmetric threats, where the tactical level unit of our focus was charged with collecting, analyzing and distributing information during the exercise. In MNE4, the participants' task was to work together as a distributed coalition to halt a pre-crisis situation from developing into a war by identifying and assessing a variety of military and non-military interventions.

In all studies, the questionnaires were distributed to and completed by the participants onsite near the end of the exercises. In study 1, participants were personnel at the CJOC, where they contributed as a result of self-selection after information about the survey was communicated at a unit brief. In study 2, questionnaires were distributed to the entire unit. In study 3, questionnaires were net-based and distributed to all participants in the exercise. Concurring with the working language in the exercises being English, the questionnaires were presented in English to all participants. Prior to the first data collection, the questionnaire was scrutinized and accepted by the Human Use Committee at the US Army Research Laboratory. Participants volunteered for the studies, and all information rendered was treated with confidentiality. There were a total of 239 participants, but due to missing values on one or more variables, 19 were excluded, bringing the sample to 220 for the analyses (details in Table 1).

[Insert Table 1 about here]

### *Measures*

All measures were developed in-house. The developments were based on previous theory and research (e.g., Alberts et al., 1999; Benbasat & Lim, 1993; Tiernan et al., 2002; Zammuto &

Krakower, 1991) and earlier exploratory studies (e.g., Bjørnstad, 2002). The content validity of the items was established through peer-reviews, supplemented by semi-structured pre-interviews (13) conducted with target raters on-site at the first study (AW04 exercise). The latter further served to tighten the questionnaire in terms of non-adequate items being removed. The univariate characteristics (M and SD) of all items included in the current study are presented in Table 2.

*Organizational structure, processes, flexibility, and alignment (independent and mediating variables)*

Organizational structure, processes, and flexibility were each measured by one-item 5-point bipolar measurement scales. The lead stem was “In the following questions we ask you to compare this exercise-organization with the organization you normally work in. How would you describe”. Organizational *structure (hierarchy/flat)* was assessed by the item “the level of hierarchy here?”. The response choices were *much more hierarchical (1)*, *a bit more hierarchical (2)*, *no difference (3)*, *a bit flatter (4)*, and *much flatter (5)*. Akin to the measure employed by Zammuto and Krakower (1991), organizational *processes (centralization/decentralization)* was assessed by the item “the level of centralization/decentralization (self-organization) here? ”. The response choices were *much more centralized (1)*, *a bit more centralized (2)*, *no difference (3)*, *bit more decentralized (4)*, and *much more decentralized (5)*. Organizational *flexibility* was assessed by the item “the flexibility here?”. The response choices were *much less flexible (1)*, *a bit less flexible (2)*, *no difference (3)*, *bit more flexible (4)*, and *much more flexible (5)*. *Alignment* was an estimate of the level of congruence between structure and processes, represented by a 5-point scale. Low scores indicate low congruence, i.e., opposite scores on structure and processes, (e.g., structure = 1 and

processes = 5), and high scores indicate high congruence i.e., identical scores on the two measures, (e.g., structure = 1 and processes = 1).

*Information sharing, decision making, and organizational rating (dependent variables)*

*Information sharing* was assessed by two items, each with a unique 5-point bipolar measurement scale, measuring the perceived amount (item 1) and contentment (item 2) of the information. The lead stem was “Pertaining to this exercise,“. The wording of item 1 was “do you feel like you get too much or too little information in order to make decisions”. The response choices were *too much* (1) *somewhat more than I need* (2) *appropriate amount* (3), *somewhat less than I need* (4), and *too little* (5). For the second item, worded “how content are you with the information you receive?”, response choices were *very content* (1), *somewhat content* (2), *neutral* (3), *somewhat discontent* (4), and *very discontent* (5). Item 1 was recoded into a 3-point scale so that high (3) signifies appropriate amount of information, and item 2 was recoded so that high (5) indicates very content with information. The Cronbach's alpha (based on standardized items) for the information sharing measure was .67.

*Decision making* was assessed by three items, each with a unique 5-point bipolar measurement scale, measuring the perceived timeliness (item 1), quality (item 2), and success (item 3) of decisions. The lead stem was “Pertaining to this exercise,“. The wording of item 1 was “in your opinion, are decisions made too slow, too fast, or just right in your environment? ”. The response choices were *too slow* (1) *a bit slow* (2) *just right* (3), *a bit fast* (4), and *too fast* (5). Another sample item was “how would you rate decision quality in your environment?” (item 2). Response choices for this item were *very good* (1), *good* (2), *neutral* (3), *poor* (4), and *very poor* (5). Response choices for item 3 ranged from *very successful* (1) to *not at all successful* (5). Item 1 was recoded into a 3-point scale where high (3) signifies very good timeliness (answer

category *just right*), item 2 was recoded so that high (5) indicates very good quality, and item 3 was recoded so that high (5) indicates very successful. The Cronbach's alpha (based on standardized items) for the decision making measure was .70.

*Organizational rating* was assessed with one item, following the same lead stem as used for the measurement of structure, processes, and flexibility. The wording of the item was “rate this organization compared to what you are used to?”. The response choices were *much poorer* (1), *somewhat poorer* (2), *no difference* (3), *somewhat better* (4), and *much better* (5).

### Results

To examine the relationships between the variables, a correlational analysis was conducted (Table 2). The assumptions of linearity, univariate and multivariate normality necessary for more advanced analyses were evaluated, indicating that all measures had acceptable values. However, alignment was found to be only marginally acceptable in terms of normality, being somewhat negatively skewed (-1.077).

[Insert Table 2 about here]

#### *Path analysis: Structural equation modeling*

The hypothesized relationships between the variables (model 1, Figure 1) was tested in a path analysis using structural equation modeling (SEM) conducted in AMOS 16.0 (maximum likelihood estimation). To test the moderating effects of alignment, the alignment, structure and processes variables were first mean centered, after which two interaction terms were calculated.

The results demonstrated that the overall fit of model 1 was satisfactory; the chi-square to degrees of freedom ratio was below 2 ( $\chi^2/df = 40.9/29$ ), the Comparative Fit Index (CFI = .985) was above the accepted criteria of .95 (Hu & Bentler, 1999), and the Root Mean Square Error of

Approximation (RMSEA = .043) was below the limit of .05 for a close fit (Browne & Cudeck, 1993).

No interaction effects were evident; all paths originating from the two interaction terms were near zero and nonsignificant. This finding suggested post hoc modifications to develop a more parsimonious model. The interaction terms were thus removed. Being suitable for comparing non-nested models (Tabachnick & Fidell, 2007), the Akaike Information Criterion (AIC) was used compare the model without the interaction terms (model 2) with the hypothesized model (model 1). The AIC indicated that model 2 was better-fitting and more parsimonious than model 1 (i.e., AIC dropped from 162.875 to 117.193). The other model fit measures (CFI = .976, RMSEA = .045) were virtually unchanged.

To refine model 2 further, the remaining nonsignificant paths were removed. When all nonsignificant paths had been removed, a final  $\chi^2$  difference test was conducted to compare this final model with model 2. The test did not indicate any significant deterioration of the model,  $\chi^2_{diff}(8) = 2.373, p = .967$ . On the contrary, the other fit measures (CFI = .989, RMSEA = .026, AIC = 103.6) demonstrated that the final model was both better fitting and more parsimonious than its predecessor. Because post hoc modifications were performed, a correlation was calculated between the hypothesized model (model 1) parameter estimates and the final model parameter estimates. Results indicated that the parameter estimates were practically unaffected despite modifications of the model,  $r = .999, p < .001$ .

[Insert Figure 2 about here]

The final model (Figure 2) shows that flat organizational structure influences effectiveness positively, as measured by information sharing, decision making, and organizational rating. Only one direct effect of flat structure was observed (on decision making),

with most effects mediated by flexibility. These results denote partial support for Hypotheses 1 and 3. The model further indicates that the effects of decentralized processes on effectiveness are positive and fully mediated by flexibility. This finding partially supports Hypotheses 2 and 3. In turn, the effectiveness measures were also found to be interrelated; the analysis demonstrated partial mediation by information sharing of the effects on decision making and organizational rating. Finally, the model shows that alignment has a positive effect on one of the effectiveness measures, that is, on organizational rating. No support was found for any other effects of alignment. These latter findings offer limited support to Hypothesis 4.

#### *Cross-validation of the final path model*

As the study's three sub-samples (studies 1, 2, and 3) originated from three different organizational settings, multiple-group SEM was used to examine whether the final path model was generalizable across the sub-samples. Cross-validity of the final path model was tested by comparing the fit of a constrained model (meaning that all factor loadings, path coefficients, and the one covariance was set to be identical in all of the three sub-samples) with an unconstrained model (i.e., a model where all of the these parameter values could vary freely within the three samples). The results showed no significant difference between the two models [ $\chi^2_{diff}(24) = 29.5, p = .20$ ]. A nonsignificant difference in  $\chi^2$  value between these two models indicates that the parameter values displayed in Figure 2 are generalizable across the three sub-samples (e.g., Tabachnick & Fidell, 2007). The same procedure also showed no significant difference between civilian personnel (19% of the total sample) and military personnel [ $\chi^2_{diff}(16) = 15.9, p = .60$ ]. These results suggested that the final path model was generalizable across the three organizational settings, as well as across the civilian-military divide.

#### Discussion

The purpose of the present study was to research the effects of central network organizational variables in military contexts. The results of the SEM analyses supported the propositions that flat organizational structure and decentralized processes have positive effects on both flexibility and effectiveness (effectiveness measured by information sharing, decision making, and organizational rating). The links to effectiveness were, however, almost fully mediated by flexibility; there was found only one direct effect, i.e., of structure on decision making. Hence, there was found very little support for the proposed direct effects of structure and processes. The results provided only limited support for the proposition that alignment has both moderator and direct effects. Moreover, the degree of alignment between structure and processes was found to have a significant effect on organizational rating only. No support was found for the proposed moderating effects of alignment. As the literature suggested (e.g., Dennis, 1996), the effectiveness measures were also found to be interrelated.

#### *Theoretical and practical implications*

The finding of flexibility and information sharing mediating the effects of flat structure and decentralized processes, provide empirical evidence of the purported centrality of both flexibility and information sharing in the network organization literature (e.g., Alberts & Hayes, 2003). In fact, as there were found less direct effects than expected, the centrality of flexibility in the present results are understood to be even stronger than anticipated from the network literature. The present results also contribute to research beyond network theory by adding empirical evidence from military organizational contexts to the literature on both the structure and flexibility, and the processes and flexibility links (e.g., Hatum & Pettigrew, 2006; Volberda, 1998; Zammuto & Krakower, 1991). Because the empirical evidence was equivocal pertaining to

the processes-flexibility link (e.g., Hatum & Pettigrew, 2006; Zammuto & Krakower, 1991), the present results also serve to clarify this link in relation to military contexts.

The current results propose that military, traditionally bureaucratic types of organizations, may benefit from flatter hierarchy and more decentralization in order to reach their goal of increased flexibility and effectiveness – quite in line with network theories (e.g., Alberts & Hayes, 2003; Snow et al., 1992). The present work thus brings the theoretical foundation of network theories further towards implementation in military organizations as empirical material on these propositions of network theories largely have been missing.

However, military organizations are not the only organizations that have maintained a bureaucratic organizational type. Indeed, after a long period of forecasting as well as describing the demise of the bureaucratic organization (e.g., Tiernan et al., 2002), recent empirical research has started to gather evidence for the persistence of bureaucratic organization (e.g., Graetz & Smith, 2007; Walton, 2005). Simultaneously, there have emerged advocates for more hybrid forms of organization, which ideally maintains the stabilizing effects of a traditional organization while also implementing changes to achieve the dynamism of the network organization (e.g., Graetz & Smith, 2007; Volberda, 1998). However, little is known as to what may be the optimal blend of traditional bureaucratic and newer network organizational characteristics. In fact, hybrid forms of organization may be conceived to involve a great risk of misalignment; rather than combining the advantages of the two organizational archetypes, a hybrid form could potentially promote the disadvantages of both. The present research used theories of organizational alignment (e.g., Galbraith, 2002; Kotter, 1978) to develop an understanding of a need for alignment between central network organizational variables in order to realize their expected potential. The results, however, provided only limited support for the proposition that



organizational structures and processes need to be aligned for the organization to be efficient. The shortcomings may be explained by a lack of misalignment issues in the data studied. On closer inspection, the alignment variable revealed a very high mean (4.21), indicating that the respondents' perceptions of the organizational structure and processes were well aligned. The results nevertheless supported the proposition that flatter structure and decentralized processes provide increased flexibility and effectiveness in organizations where the structure and processes are well-aligned. Interpreted alongside past theory and research (Galbraith, 2002; Kotter, 1978; Kvande, 2007; Vego, 2003), the present findings may still be understood to advocate an awareness of the internal alignment of organizational components in organizational change implementation. Adding a focus on the alignment of focal organizational components in future studies could also help researchers to better discern which organizational solutions are superior, thereby lessening the conflicting findings not uncommon to the literature on organizational variables (e.g., Hatum & Pettigrew, 2006; Richardson et al., 2002; Zammuto & Krakower, 1991). Indeed, it may be that the findings of Hatum and Pettigrew (2006) were contrary to those of Zammuto & Krakower (1991) and network theory in general, due to an alignment issue. The shortcomings described in the present study nevertheless indicate a need to study the effects of alignment further in future research.

#### *Limitations and future directions*

Caution is advised regarding the interpretation that decentralization, flat structure, and alignment *predict* information sharing, decision making, and organizational rating. Because the present study relies on cross-sectional data, the relationships found are not necessarily causal relationships. The research on which this study is founded nevertheless advocates such an interpretation (e.g., Alberts & Hayes, 2003; Volberda, 1998; Zammuto & Krakower, 1991).

Having employed several single-item measures in this study may be considered a weakness (e.g., Gosling, Rentfrow, & Swann, 2003). However, the focus on perceptions of organizational attributes rather than on underlying psychological constructs should allow for short, straightforward measurements (e.g., Rossiter, 2002), which have the advantage of minimizing item redundancy, time for completion, and participant fatigue (Gardner, Cummings, Dunham, & Pierce, 1998). These were all important concerns in the present study, as the items were part of a larger survey battery and the respondents were under considerable task pressure during the exercises. Wanous, Reichers, and Hudy (1997) successfully tested and employed a single-item measure of job satisfaction, demonstrating that the use of single-item measures should not be considered a fatal flaw. However, future research may consider more comprehensive measures where this is feasible.

The results of this study are based on participants' perceptions rather than on direct organizational measures, in line with the research on which this study was based (e.g., Campion et al., 1993; Zammuto & Krakower, 1991). Employing participants' subjective perceptions to make inferences about an organization's characteristics is often considered the most relevant approach in organizational studies (Patterson et al., 2005; Spector, 1994); the collective reality of an organization may be understood as the sum of the realities perceived by its participants (e.g., Patterson et al., 2005). There is, however, a debate about levels of analysis in organizational research (e.g., Schnake & Dumler, 2003). To address concerns regarding the individual level of analysis, the organizational items (independent variables) were phrased so that each individual evaluation was explicitly relative to the respondent's normal organizational setting. The analysis of the predictive value of these variables thus become relative to the functioning of many organizations rather than simply reflecting individuals' perceptions of the organizations in which

they presently were involved. This approach additionally proposes that the findings may be understood at an organizational level. To further test the robustness of the current findings, it may be useful to employ experimental manipulations and direct objective measures at both individual and organizational levels of analysis in future research.

### Conclusion

The results suggested that flatter structures and more decentralized processes may provide greater effectiveness in military organizations. The data furthermore supported the centrality of flexibility portrayed in the network literature; flexibility was found to almost fully mediate the effects of structure and processes on effectiveness. Because structures and processes were found to be relatively well aligned in the organizations studied, results could not reveal the effect of misalignment, suggesting further research would be needed to establish this. Overall, the present results contribute to the advancements of network organizational theory from more than just a theory in military organizational contexts.

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## Tables

*Table 1. Study characteristics and participant demographics overview.*

	<i>Study 1: AW04</i>	<i>Study 2: BG05</i>	<i>Study 3: MNE4</i>
<i>N</i> total / corrected for missing values	28 / 25	55 / 53	156 / 142
Military hierarchical level	HQ	Tactical	HQ
Exercise duration	Two weeks	Two weeks	Three weeks
Data collection site	Verona, Italy	Steinkjer, Norway	Distributed <sup>a</sup>
Services represented in sample	Joint	Army	Joint
Composition	Multinational	National	Multinational
Number of nationalities in sample	8 <sup>b</sup>	2 <sup>c</sup>	9 <sup>d</sup>
% Response rate	100 <sup>e</sup>	60	84
% Military / Civillian	96 / 4	100 / 0	71 / 29
NATO rank			
%* Officers: OF 1-10 (1-2 / 3-5 / 6-9)	82 (-)	94 (77 / 17 / 0)	98 (21 / 73 / 4)
%* Warrant officers: WO 1-5	0	0	2
%* Other ranks: OR 1-9	18	6	0
% Male / Female	82 / 18	91 / 9	95 / 5
Years of military service: Mean / SD	18.8 / 10.0	10.4 / 6.7	-

*Note.* <sup>a</sup> The MNE4 was a distributed exercise conducted from participating nations (Canada, Finland, France, Germany, Sweden, the UK, and the US) and the NATO HQ in Turkey. Data were collected at the different sites.

<sup>b</sup> Denmark (1), Germany (2), Greece (3), Hungary (2), Italy (1), Turkey (1), the UK (8), and the USA (10).

<sup>c</sup> Netherlands (2), Norway (53). <sup>d</sup> Canada (21), Denmark (23), Finland (7), France (13), Germany (6), Sweden (8), Turkey (23), the UK (12), and the US (43). <sup>e</sup> Participants came at will to researchers' office to fill in questionnaires, hence the 100% response rate (representing 31% of the DJTF personnel total).

\* % is calculated from military part of sample.

*Note.* Joint = all services (army, navy, and air force). Missing information is denoted by “-” in the table.



*Table 2. Means, standard deviations, and zero-order correlation coefficients.*

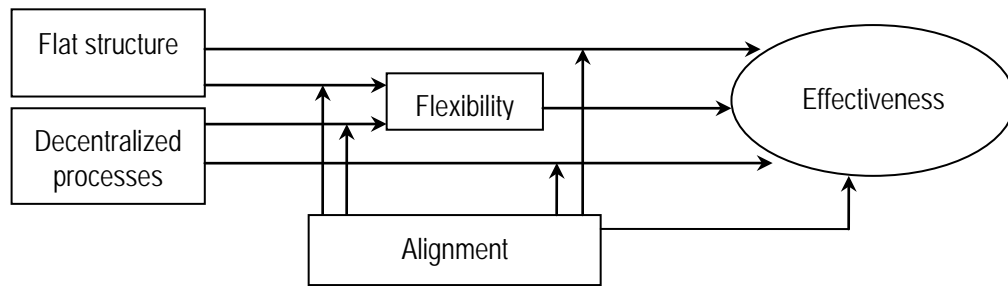
	Mean	SD	1	2	3	4	5	6	7	8	9
1. Structure (flat/hier.)	3.13	1.11									
2. Processes (dec./cen.)	3.08	1.14	.399***								
3. Alignment (1 & 2)	4.21	0.93	-.110	.117							
4. Flexibility	3.03	1.13	.371***	.408***	.046						
5. Org. rating	2.95	1.03	.157*	.202**	.182**	.518***					
6. Info. amount	2.31	0.70	-.016	-.004	.067	.224**	.294***				
7. Info. contentment	3.16	0.95	.123	.106	.029	.266***	.389***	.499***			
8. Decision timeliness	2.46	0.68	.085	-.037	-.060	.147*	.151*	.202**	.189**		
9. Decision quality	3.72	0.81	.244***	.090	.030	.255***	.313***	.181**	.302***	.348***	
10. Decision success	3.99	0.83	.123	.045	.010	.129	.233**	.202**	.252***	.329***	.630***

*Note.* High scores indicate flat structure (FS), decentralized processes (DP), high alignment (A), high flexibility (F), high organizational rating (OR), appropriate amount of information (information sharing, IS, item 1), high contentment with information (IS item 2), high decision timeliness (decision making, DM, item 1), high decision quality (DM item 2), and high decision success (DM item 3). All variables have a scale from 1-5, except information sharing item 1 and decision making item 1, which both have 3-point scales.

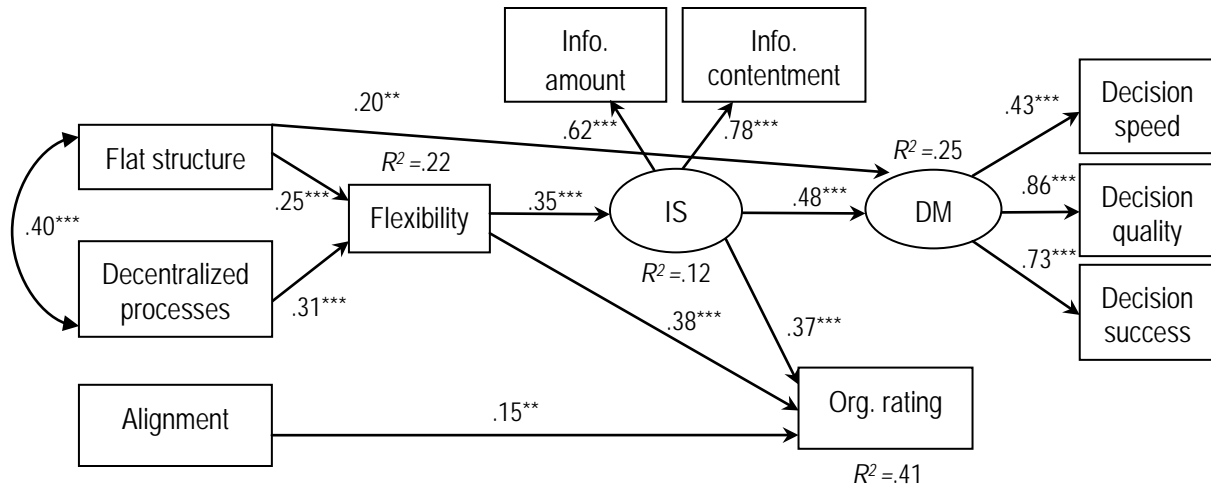
\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

$N=220$ .

## Figures



*Figure 1. Conceptual model.*



\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

$N = 220$ .

Figure 2. Final model representing the relationships between the variables (structure, processes, alignment, flexibility, information sharing (IS), decision making (DM), and organizational rating; standardized coefficients).

# Effects of Cultural Diversity on Trust and its Consequences for Team Processes and Outcomes in Ad Hoc Distributed Teams

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## Abstract

This quasi-experimental study explores trust as a mediator, explaining how cultural diversity may affect team processes and outcomes in distributed ad hoc teams. Data were collected both through self-report and direct behavioral measures from a military sample. Our results demonstrate significantly lower trust in culturally heterogeneous distributed teams than in homogenous teams. In turn, trust was found to be positively related to team processes (i.e., communication). The results suggest trust will add explanatory value as a mediator in future team composition research. In terms of performance, outcome was not significantly predicted. Aiming to contribute to the future successful use of internationally composed teams, the implications of and the need for further research in these areas are discussed.

Key Words: team cultural diversity, heterogeneity, trust, team processes, outcome, ad hoc distributed teams

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## Introduction

The globalization of modern organizations engenders international collaboration and transnational teamwork (e.g., Arnold, Cooper, & Robertson, 1998; Kozlowski & Ilgen, 2005; Shuter & Wiseman, 1994). The team processes and outcomes in internationally composed teams may be affected by cultural differences in values and behavior across the collaborating nationalities (e.g., Cox, Lobel, & McLeod, 1991; Hofstede, 2001; Oetzel, 1998; Schneider & Barsoux, 1997; Thomas, 1999). Research by Watson, Kumar, and Michaelsen (1993) suggested that any negative impact of cultural differences on team output may be the greatest when a team has just been formed. Because of an increased use of ad hoc organized teams (e.g., Handley & Lewis, 2001), the finding of Watson et al. indicates a need for further

investigation of team cultural diversity in such contexts.

Theory on trust indicates that team composition (in terms of cultural diversity) also may play a central role in the building of trust (e.g., McAllister, 1995; Williams, 2001). In turn, research has suggested that trust facilitates key team processes and outcomes (e.g., Colquitt, Scott, & LePine, 2007; Dirks & Ferrin, 2002; Jarvenpaa & Leidner, 1999; Luring & Selmer, 2010). Seen together, this theory and research suggest that trust may contribute to the unveiling of how team cultural diversity affects team processes and outcomes in ad hoc teams. However, because the building of trust has been found to be positively related to face-to-face interaction (e.g., Connaughton & Shuffler, 2007; Oertig & Buergi, 2006), the increase in geographically distributed collaboration (e.g., Connaughton & Shuffler, 2007; Handley & Lewis, 2001) adds new questions to the role of trust.

The main aim of the present research is to increase the understanding of team cultural diversity in ad hoc distributed teams by examining the role of trust, primarily as a mediator between team composition, and team processes and outcome measures. This aim answers to the calls for research to focus more both on the link between national culture and trust (e.g., Branzei, Vertinsky & Camp, 2007) and on how the effects of

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diversity on team processes and outcomes are mediated (Mannix & Neale, 2005). The aim also contributes to the need for more knowledge of how cultural diversity affects trust in distributed teams and of the effects of distribution and cultural diversity on team processes and outcome variables in concert (Connaughton & Shuffler, 2007). Furthermore, team collaboration across borders has most often been researched in the context of business, but it is also extremely relevant for the operational work of international medical, military, police, and crisis relief teams. To meet this need for, and gap in research, the present research studies military teams. Corresponding to the above outlined focus, *cultural diversity* is defined as national cultural diversity.

## **Team Cultural Diversity and Team Processes**

Although organizational research has often viewed team member heterogeneity to be at least potentially advantageous for organizational and team performance through an increased pool of knowledge, viewpoints and creativity (e.g., Arnold et al., 1998; Hackman, 2002; Schneider & Barsoux, 1997), meta-analyses and reviews have shown that results from research on team composition are mixed and often not easily interpreted (e.g., Horwitz & Horwitz, 2007; Mannix & Neale, 2005; Stahl, Maznevski, Voigt, & Jonsen, 2010). However, the pattern seems to be that demographic type diversity (e.g., ethnicity/nationality, gender, race, and age) mainly leads to process losses, in terms of cooperative problems, whereas competency based diversity mainly leads to increased problem solving abilities, due to an increased pool of knowledge (Mannix & Neale, 2005). Cultural diversity may have the potential to lead to process losses but also to increase problem solving abilities (Stahl et al., 2010). This two-sidedness arises from the fact that cultural diversity includes the element of demographic differences (potentially leading to cooperative problems) and an increased pool of knowledge brought about by the differences in background (potentially leading to increased problem solving abilities and creativity). Watson et al. (1993) found in their research that newly formed culturally diverse teams experience more negative consequences of cultural diversity than longer-standing teams, suggesting that cultural diversity may tend to be more problematic in ad hoc teams.

Van Knippenberg, De Dreu, and Homan (2004) proposed that team processes and outcomes, such as collaborative behaviors and performance, do not depend on the type of diversity, per se, but rather on how the diversity is interpreted. The interpretation of diversity is understood to depend on factors such as the salience of the social categorization, as well as on motivation and ability.

This interpretation would in turn result in either processes of social categorization and intergroup bias or elaboration of task-related information. The model predicts that social categorization and group bias-type processes affect performance negatively, whereas elaboration-type processes affect performance positively. Cultural differences may often be salient in internationally composed teams, especially in geographically distributed ad hoc teams where other member information becomes more limited. This salience suggests a risk that cultural diversity may induce a social categorization and intergroup bias effect, consequently leading to lower output. Furthermore, an elaboration process may be obstructed by cultural differences in values and behavior because differences in cognitive schemas of team members from different cultures can make the interpretation and prediction of other members' behavior more difficult than if team members were from the same culture.

## **Trust as a Mediator between Team Cultural Diversity and Team Processes**

Research on trust further adds an explanation of how social categorization and group bias may negatively affect team processes and outcomes. The current study focus on ad hoc distributed teams requires a definition of trust that reflects both the short time frame and the distributed setting. McAllister (1995) and Webber (2008) found reliability, dependability, and competence to be central elements of trust in a shorter time frame, labeling it cognitive trust. Expanding on this research, Kanawattanachai & Yoo (2005) found cognitive trust to be the predominantly important type of trust in distributed work teams. Complementing the research on cognitive trust, Jarvenpaa, Knoll, & Leidner, (1998) and Jarvenpaa & Leidner (1999) found that trust in ad hoc distributed teams was highly task- and action-related, interpreted as "swift" trust, confirming Meyerson, Weick, & Kramer's (1996) earlier proposition. Moreover, swift trust is recognized as a cognitive form of trust that is based on categorical assumptions and implicit theories more than on the actual trustee, as well as being focused on expectations of future behavior (Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Meyerson et al., 1996). In line with this research we define *trust* as swift trust.

It has been suggested that group bias has a negative impact on the level of trust of different others through influencing the causal attributions of those others' dispositions, motives and intentions (Kramer, Brewer, & Hanna, 1996; see also Van der Zee, Vos, & Luijters, 2009). Additionally, as indicated above, a lack of the

appropriate cognitive schemas can obstruct the ability to understand and predict the actions of diverse team-members, consequently lowering the potential for trust. The group bias and lack of appropriate schemas in culturally diverse teams indicate a possible double negative effect of cultural diversity on trust. Concurring with this line of thought, McAllister (1995) argued that cultural similarity promotes trust. In turn, not trusting one's team members can lower the motivation to engage in collaborative-type behaviors. Indeed, trust has been found vital for central team processes such as communication (e.g., Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Luring & Selmer, 2010; Rico, Alcover, Sanchez-Manzanares, & Gil, 2009), and outcomes in terms of performance (e.g., Colquitt et al., 2007; Dirks & Ferrin, 2002). This research suggests trust may be understood as a mediator between cultural diversity and team processes. Consecutively, team processes may be understood to mediate the effects of trust on output (Luring & Selmer, 2010). Because communication has been identified as a key team process in research on trust, swift trust, multinational distributed teams, and team diversity (e.g., Connaughton & Shuffler, 2007; Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998; Kozlowski & Ilgen, 2005; Luring & Selmer, 2010; Mannix and Neale, 2005; Rico et al., 2009) and because communication is the mode of distributed cooperation, team processes were defined as communication in the present research.

The above suggested relationships can be summarized into three hypotheses:

Hypothesis 1: *Cultural diversity has a negative effect on trust in distributed ad hoc teams*

Hypothesis 2: *Cultural diversity influences communication mediated by trust*

Hypothesis 3: *Communication influences outcomes positively*

The theoretical background and cited research on which this article is built stem from both individual- and group-level research. As indicated by Serva, Fuller, and Mayer (2005), both antecedents and consequences of trust have cross-level relevance. This relevance suggests an advantage of studying the hypotheses at both levels, also making results more interpretable in comparison with past and future research conducted either at the individual or group level of analysis.

## Method

### Design

A quasi-experimental design was employed to study the hypotheses. The difference in team composition, in terms of cultural homogeneity/heterogeneity, represented the experimental manipulation. 32 teams, each consisting of four members, were formed. 24 of the teams were culturally homogenous (i.e., all team members from the same culture/nation), and 8 of the teams were culturally heterogeneous (i.e., all team members from different cultures/nations). Heterogeneity and diversity are understood to describe the same attribute and are employed interchangeably.

A net-based computer game, adapted for our research purposes through the Situation Authorable Behavior Research Environment (SABRE) (Warren et al., 2006), provided a controlled environment that ensured the same conditions for all teams, leaving only the team composition to vary. Each team participated in only one experimental game session, and each session was run with one team only, making a total of 32 game sessions. In both conditions, participants did not see each other during the game sessions, and the game itself also provided anonymity. The data collection was an international collaborative effort by Bulgaria, the Netherlands, Norway, Sweden, and the USA, within the context of a NATO research group (see Authors' note).

### Participants

All participants were volunteers recruited from the same population of military officers in the two experimental conditions. Participants were assigned to either the culturally homogenous or the culturally heterogeneous teams.

Participants in the homogenous teams were from the Netherlands ( $n = 12$ ), Norway ( $n = 56$ ), and the USA ( $n = 28$ ). Participants in the heterogeneous teams were from the Netherlands ( $n = 8$ ), Norway ( $n = 6$ ), the USA ( $n = 6$ ), Bulgaria ( $n = 6$ ), and Sweden ( $n = 6$ ).<sup>1</sup> Each heterogeneous team of four was randomly composed of participants from the five nations. Nationalities included were understood to be culturally different on several dimensions, as indicated by cross-cultural research (e.g.,

<sup>1</sup> To ensure that this slight difference in nationalities represented in the homogenous and the heterogeneous team conditions did not affect results (in line with demands for matched samples in cross-cultural research, e.g., Van de Vijver & Leung, 1997), appropriate measures were taken. Additional analyses were conducted to both control for the unequal numbers of participants from the different countries and to rerun all analyses with the Bulgarian and Swedish participants excluded from the heterogeneous team condition. The results persisted through these measures (details in results and footnotes 2-4).

Hofstede, 2001; House et al., 2004; Soeters, 1997). The sample size in all analyses was  $N = 128$  at the individual level and  $N = 32$  at the group level. 124 participants were male, and four were female, aged from 20 to 57. The mean age was 30.6 years, with a standard deviation of 7.8.

## Procedure

Participants came into a lab and received a short briefing including information about the nationalities of their team-players. Participants in the homogenous team situation were able to see each other upon arrival (but did not interact), whereas this was not possible in the heterogeneous team situation. They were subsequently assigned to a computer and then started the game learning sessions (tutorial). One player in each team was randomly assigned to be the team leader. The experimental game session was timed to exactly one hour. Computerized survey questions followed after the game sessions, after which a quick debriefing was given.

In the game scenario, the participants were in a team whose task was to find caches of weapons in a modern urban environment. Team points were accrued by finding the hidden weapons. To execute their mission, the participants had access to a set of tools in the game. These tools were scarce, to promote cooperative behaviors between the players. Communication between the players was accomplished via a chat function in the game. The choice of a written mode of communication reflects that geographically distributed teams rely heavily on written computer-mediated communication. One common language, English, was used for all communication, also in the culturally homogenous team situation.

## Task Type and Game Relevance

Following the typology for multinational group tasks by Hambrick, Davison, Snell, & Snow (1998), the current computer game group tasks would best fit the definition of a hybrid of coordinative, creative, and computational task types. First and foremost, the group tasks were coordinative in that the team members had to coordinate their behaviors and cooperate to reach the game goal (i.e., find crates with weapons and collect them using the different tools they had divided amongst themselves, which in turn gave the team points). Second, the group tasks were computational in that the team members needed to assemble, share, and analyze information to solve problems and make decisions about how to find the weapon crates, as well as lose as few points as possible in the process. Third, the tasks were creative because there was no predetermined way in which the participants should solve their tasks. The coordinative and computational task components made the game well-suited for studying cooperative team processes such as

communication. The creative component also aptly simulated the type of contexts in which ad hoc distributed teams often operate (i.e., no structured tasks or predetermined solutions).

## Variables and Measurements

**Trust.** The measure of trust focuses on the expectations of fellow team members' reliability, dependability, and competency in central task-related team behaviors, hence building on research on cognitive (McAllister, 1995; Webber, 2008) and swift trust (Meyerson et al., 1996; Jarvenpaa & Leidner, 1999; Jarvenpaa et al., 1998). The adaptations made in the current measure aim to both ensure ecological validity and meet the need for a measure that focuses on elements of relevance to trust in a shorter time frame. This means that elements in the measure employed by Jarvenpaa and colleagues that were found to be less relevant in a short time frame, such as benevolence, were replaced by items on reliability, dependability, and competency, and relating directly to the current team tasks. The task focus directly mirrors Jarvenpaa et al.'s finding this to be a defining feature of swift trust.

The measure included three items rated on a 5-point scale with answer categories from "very doubtful" (1) to "very confident" (5). Items focus on the positive expectancy of future task-related team-type behaviors (i.e., information sharing, assistance, and fulfillment of responsibilities). A sample item is: "How confident were you that team members would fulfill their responsibilities?"

Cronbach's alpha demonstrated satisfactory reliability of the measure ( $\alpha = .76$ ). For the group-level analysis, an aggregated mean score of trust was computed based on the three items, in line with the procedure used in the work of Jarvenpaa and Leidner (1999), Jarvenpaa et al. (1998), and Rico et al. (2009). Aggregating the scores to the group level then allowed for an investigation of how the average trust in fellow team members affects collective outcomes at the team level.

**Communication.** Communication was operationalized as communication quantity and communication quality. To avoid the problem with common method variance, direct observations of communicational behavior were employed. The game-log of the written team communication (i.e., chat messages) formed the basis for the communication measures.

Communication quantity was measured in terms of the number of communicative utterances made by each participant within the teams, similar to Jarvenpaa, Shaw, and Staples (2004) who measured the number of e-mails in their research on global virtual teams and trust. For the

group-level analyses, scores were aggregated to provide a mean score for each team.

Communication quality was defined as the observed team collaborative effort toward a common goal, in terms of team members' willingness to support and aid each other in their task completion and the level of friendly atmosphere within the team. This focus reflects previous research on correlates of trust (e.g., Jarvenpaa et al., 1998; Colquitt et al., 2007). Communication quality was estimated (mean score) from two measures of communicated helpfulness and communication climate at the group level. Both helpfulness and communication climate were calculated from observer ratings on 5-point scales, completed on the basis of print-outs of each team's chat messages retrieved from the game-log. Helpfulness was rated from "not at all" (1) to "all the time" (5), and communication climate was rated from "very unfriendly" (1) to "very friendly" (5). The ratings were completed by two researchers (one unfamiliar with the hypotheses), and averaged scores from the raters were used in the analyses. The inter-rater reliability, estimated through the intra-class correlation coefficient, was .71 for helpfulness and .75 for communication climate. Reliability of the composite communication quality measure was satisfactory ( $\alpha = .82$ ).

**Outcomes.** Outcomes were operationalized as performance and measured by the points achieved in the computer game (further described under "Procedure"). This performance measure corresponded with participants' information about their game mission, and constituted an accurate measure of whether the participants reached their official team goals, hence providing good face validity. Game points were automatically logged in the game and measured at the

individual and group levels, giving a direct performance measure. The team score equaled the aggregated mean individual score.

**Covariates.** English language ability was included as a covariate in the analyses to control for the possibility of differences in language ability affecting results. It was estimated by four items ( $\alpha = .91$ ) (Bjørnstad, 2008).

Nationality and any familiarity with other team members were also controlled for in the analyses, as were team member heterogeneity other than culture (i.e., age, gender, rank, and educational level). Familiarity with other team members was measured by a questionnaire item rating familiarity from "not at all familiar" to "very familiar" (7-point scale). Heterogeneity in age, rank, and educational level of members within each team was measured by the standard deviation (*SD*) of these variables within each team. Teachman's (1980) formula for calculating group heterogeneity [ $-\sum P_i (\ln P_i)$ ] was applied to construct a heterogeneity index in gender for each team (where  $P_i$  is the proportion of members of a category within the group).

## Levels of Analysis

Both individual and group level analyses were included to explore the cross-level validity of the proposed hypotheses, because both levels play an important role in the issues analyzed. Individual-level analyses were performed to study the relationships between heterogeneity, trust, communication quantity, and performance, and group level analyses were performed to study the relationships between heterogeneity, trust, communication quantity, communication quality, and performance.

**Table 1. Descriptive statistics for variables measured at the individual level (N = 128)**

	Mean	SD
Trust <sup>a</sup>	3.5	0.9
Communication quantity	44.0	27.8
Performance (game points)	220.5	424.0
Familiarity with teammates <sup>b</sup>	3.0	2.1
Language ability <sup>a</sup>	3.1	1.2
Education <sup>c</sup>	2.9	1.0
Military Rank <sup>d</sup>	1.9	1.2

<sup>a</sup> Range 1-5. <sup>b</sup> Range 1-7. <sup>c</sup> Range 1-5 (1 = High school, 5 = PhD/Doctor's degree). <sup>d</sup> Range 0-5 (0 = Other Ranks, 1-5 = NATO Officer, OF 1-5).



**Table 2. Multilevel analysis for trust regressed on cultural heterogeneity, additional group heterogeneity indices, and familiarity with teammates**

	Intercept-only model <sup>a</sup> <i>b</i> ( <i>s.e.</i> )	+ Cultural heterogeneity <i>b</i> ( <i>s.e.</i> )	+ Additional heterogen. indices <i>b</i> ( <i>s.e.</i> )	+ Familiarity rating <i>b</i> ( <i>s.e.</i> )
<b>Fixed effects</b>				
Intercept	3.47 (0.09)**	3.57 (0.09)**	3.39 (0.18)**	3.45 (0.28)**
Cultural heterogeneity <sup>b</sup>		-0.43 (0.18)*	-0.72 (0.25)**	-0.73 (0.25)**
Additional heterogeneity indices:				
Sex			-0.08 (0.41)	-0.04 (0.43)
Age ( <i>SD</i> )			0.05 (0.03)	0.05 (0.03)
Education ( <i>SD</i> )			0.01 (0.26)	-0.02 (0.27)
Rank ( <i>SD</i> )			0.07 (0.15)	0.07 (0.15)
Familiarity with team mates				-0.01 (0.05)
<b>Random effects</b>				
Individual level	0.70**	0.70**	0.70**	0.70**
Team level	0.06	0.02	0.00	0.00
<b>Log likelihood (<math>\chi^2</math>)</b>	326.8	321.6	317.9	317.8
<b><math>\Delta \chi^2</math></b>		5.2*	3.7	0.1

\*  $p < .05$ , \*\*  $p < .01$ . <sup>a</sup>Intra-class correlation = .07. <sup>b</sup>0 = homogenous, 1 = heterogeneous

N = 128 individual level, N = 32 group level

## Statistical Analyses

Because the 128 participants were nested within 32 teams, multilevel modeling (MLM) was found to be most appropriate to analyze data at the individual level in order to make the tests of statistical significance reliable. In all the MLM analyses conducted, individuals and teams were estimated as random effects (i.e., random intercepts), because we wanted to assess variability among individuals within teams as well as variability in average scores between teams. All predictors were estimated as fixed effects, because the number of individuals within each team (i.e., four) was regarded as too low for estimating random effects (slopes) for the predictors. The SPSS mixed models procedure was employed to conduct the MLM analyses. However, MLM can only be applied for analyses where the dependent variables are at the individual (i.e., first) level. Because the communication quality variable was at the group (i.e., second) level, a separate analysis at the group level was indicated to include this.

Structural equation modeling (SEM) using the statistical program AMOS was applied to analyze the data at the group level of analysis. This method was chosen because the proposed relationships between the variables in the current study can be represented as a path model (i.e., trust is expected to mediate the influence of cultural heterogeneity on both communication quality and quantity, which in turn are expected to have effects upon performance). Although a sample size of  $N = 32$  may seem low for conducting an SEM-analysis, Herzog & Boomsma (2009) found that a ratio of sample size to estimated parameters of ~2:1 can provide accurate

estimates of model fit in small samples if Swain-corrected estimators are applied. The model presented in the results section has 13 estimated parameters, giving a ratio of 2.5:1. This correction is applied because traditional model fit measures tend to reject acceptable models too often as sample size decreases. Tanguma (2001) has, however, demonstrated fit measures, such as the comparative fit index (CFI), to be reliable even in samples as small as  $N = 20$ . To test the robustness of the statistical significance of the parameter estimates in the model, a bootstrapping procedure (bias-corrected percentile method) was applied.

## Results

### Individual Level Analyses

**Descriptive analyses.** Descriptive statistics for the variables of interest measured at the individual level are presented in Table 1.

Differences between culturally homogenous and heterogeneous teams in trust. A two-level hierarchical model assessed differences between culturally homogenous and culturally heterogeneous teams in mean trust scores (Table 2). First-level units were the 128 participants, whereas the 32 teams were the second level units. The results showed that culturally heterogeneous teams had significantly lower mean trust scores than culturally homogenous teams, a difference of 0.43 points on a 5-point scale. This corresponds to a Cohen's  $d$ -value of 0.50, indicating a moderate difference in trust scores.

Because the relationship between cultural heterogeneity and trust may be confounded by other factors such as team heterogeneity in age, gender, rank,

**Table 3. Multilevel analysis for communication quantity (log transformed) regressed on cultural heterogeneity and trust**

	Intercept-only model <sup>a</sup> <i>b</i> ( <i>s.e.</i> )	+ Cultural heterogeneity and trust <i>b</i> ( <i>s.e.</i> )	+ With cross-level interaction term <i>b</i> ( <i>s.e.</i> )	Standardized coefficients <i>β</i>
<b>Fixed effects</b>				
Intercept	3.57 (0.10)**	3.57 (0.09)**	3.60 (0.09)**	
Cultural heterogeneity		-0.25 (0.22)	-0.20 (0.21)	-.12
Trust		0.02 (0.06)	-0.01 (0.06)	-.01
Cult. heterogeneity × Trust			0.33 (0.12)**	.20
<b>Random effects</b>				
Individual level	0.27**	0.27**	0.25**	
Team level	0.22**	0.21**	0.20**	
<b>Log likelihood (<math>\chi^2</math>)</b>	241.4	239.8	232.7	
<b><math>\Delta \chi^2</math></b>		1.6	7.1**	

\*\* $p < .01$ . <sup>a</sup>Intra-class correlation = .45.

N = 128 individual level, N = 32 group level

Both predictors are grand mean centered

and education level, team heterogeneity indices for these four factors were included as level-2 predictors in the next model. The effects of these four team heterogeneity indices on trust scores were all non-significant and did not influence the effect of team cultural heterogeneity on trust scores (the difference in trust scores actually increased). Next, we controlled for any familiarity each participant may have had with his or her teammates by adding this as a level-1 predictor. Familiarity with teammates showed no relationship to trust scores and did not affect the relationship between team cultural heterogeneity and trust.

Based on the unequal numbers of participants from the different countries in the homogenous team situation, the effect of nationality was controlled for by adding nationality and interaction terms between nationality and cultural homogeneity as predictors in the MLM analysis. Including nationality did not affect the difference in trust found between homogeneous and heterogeneous groups, and the unequal numbers referred to should therefore not pose a problem.<sup>2</sup>

In sum, cultural heterogeneity in teams was the only heterogeneity factor related to individual ratings of trust in other team members. Based on this finding, the covariates mentioned above were excluded from further analyses.

**Trust and communication quantity.** A two-level hierarchical model was used to explore whether trust was

positively related to communication quantity (Table 3). Due to a substantial positive skewness in the communication quantity variable, a logarithmic transformation was conducted. The transformed communication quantity variable was used as the dependent variable in a 2-level hierarchical model, where cultural heterogeneity was entered as a level-2 predictor and individual trust scores as a level-1 predictor (Table 3). Both predictors were grand mean centered before being entered in the model. Neither of the two predictors was found to have significant main effects on communication quantity.

<sup>2</sup> Additionally, to control for any possible difference caused by not having any Bulgarian or Swedish homogenous teams, all of the above analyses were repeated with these nationalities excluded from the heterogeneous teams (i.e.,  $N = 116$ ). This measure actually resulted in a larger difference in trust scores between the two conditions, a difference of 0.7 points ( $p < .01$ ), Cohen's  $d = 0.80$ .

It was suspected that the problem with the group biasing effect and differing cognitive schemas in heterogeneous teams, as described in the theory chapter, may not only lead to lowered trust but also increase the importance of trust in heterogeneous teams relative to that in homogeneous teams. This is because trust may motivate continued communication despite the hurdles caused by the differences. To test for this possibility, a 2-level interaction term between team composition and trust was included in the model. This model was significantly better than that without the interaction term,  $\Delta\chi^2(1, 128) = 7.1, p < .01$ . The significant effect of the interaction term of  $b = 0.33$  ( $\beta = .20$ ) showed that trust was positively related to communication quantity only within culturally heterogeneous teams. An additional analysis controlling for English language ability by including this variable as a level-1 predictor neither improved the model nor altered the results presented above.

**Communication quantity and performance.** A final 2-level hierarchical model was used to assess the effect of communication quantity on performance. The results showed no significant relationship between communication quantity and performance ( $b = -8.2, p = .88$ ). Team cultural heterogeneity, trust, and the interaction term between cultural heterogeneity and trust were also included as predictors in the model. The results showed no significant effects of these predictors on performance.

## Group Level Analyses

Group level t-tests of differences in trust, communication quantity, communication quality, and performance were conducted to check for differences in mean scores between teams with culturally homogenous and heterogeneous compositions. The results presented in Table 4 indicate (in line with the MLM analyses) that the mean scores on trust were significantly higher in the homogeneous teams.<sup>3</sup>

A SEM analysis was performed at the group level ( $N = 32$ ) to explore the hypothesized relationships between heterogeneity, trust, communication quantity, communication quality, and performance in one common analysis. Based on the interaction effect found at the individual level between cultural heterogeneity and trust upon communication quantity, this interaction term was also included in the group-level model. The hypothesized relationships between the variables with estimates are presented in the form of a path model (Figure 1).

The model demonstrated a very close fit to the data according to conventional criteria (Hu & Bentler, 1999): the chi-square degrees of freedom ratio ( $\chi^2/df$ ) = 0.95, CFI = 1.00, and the root mean square error of approximation (RMSEA) = .00. Due to the close fit of the model, there was no need to apply Swain-corrected estimators of model fit (see Herzog & Boomsma, 2009).

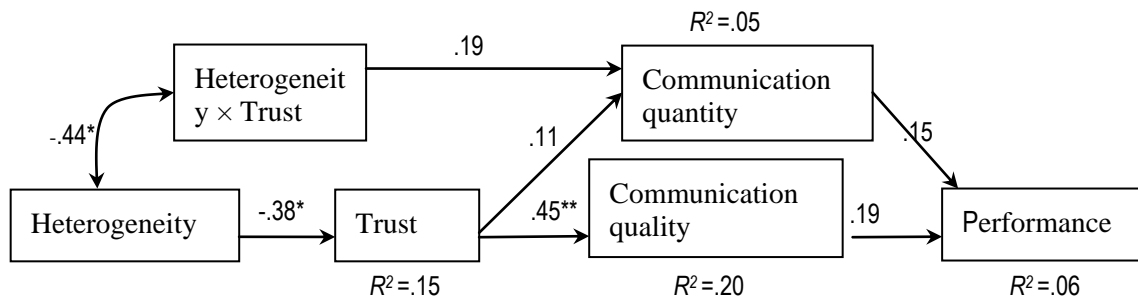
Because it seemed probable that the interaction term could also have an effect on communication quality, a post hoc modification was performed adding this path to the model. The path was found to be weak and far from significant ( $\beta = .09, p = .59$ ) and did not improve the model's  $\chi^2$  significantly ( $\chi^2_{diff}(1) = 0.30, p = .59$ ). Hence, there were no indications for adding this path to the model.

The effect of heterogeneity on trust was also significant at the group level of analysis, explaining 15% of the variance in trust. Consecutively, trust was significantly related to the composite measure communication quality (i.e., the higher the trust, the higher the communication quality score). The relationship between trust and communication quantity was in the expected direction but rather weak and not significant ( $p = .54$ ). The effect of the interaction term between cultural heterogeneity and trust on communication quantity was of the same size and direction as in the individual level analysis, though not significant at the group level ( $p = .29$ ). Both the relationship between communication quality and

**Table 4. T-tests of differences in trust, communication quantity, communication quality, and performance in homogenous and heterogeneous teams at the group level of analysis**

	Team composition	N	Mean	SD	Sig. diff. of means	d-value
Trust	Homogeneous	24	3.6	0.5	.030	0.97
	Heterogeneous	8	3.1	0.5		
Communication quantity	Homogeneous	24	46.0	20.0	.335	0.39
	Heterogeneous	8	37.9	21.3		
Communication quality	Homogeneous	24	3.9	0.9	.664	0.20
	Heterogeneous	8	3.7	0.9		
Performance	Homogeneous	24	205.5	112.6	.204	-0.52
	Heterogeneous	8	265.3	113.2		

N = 32



\*  $p < .05$ , \*\* $p < .01$

**Figure 1. Heterogeneity, trust, communication quantity, communication quality, and performance at the group level of analysis (standardized coefficients,  $N = 32$ ).**

performance and between communication quantity and performance were in the expected direction, though these effects were non-significant ( $\beta = .19$ ,  $p = .28$ , and  $\beta = .15$ ,  $p = .39$ , respectively).

Some additional analyses were conducted to test the robustness of the model.<sup>4</sup> A bootstrapping procedure, drawing 500 random samples of  $n = 32$  (with replacement) from the entire sample, was employed to test for possible biases in the standard errors of the parameter estimates. This procedure resulted in the same conclusion as described above, i.e., the effect of cultural heterogeneity on trust and the effect of trust on communication quality were both significant at the 5% level. The effect of English language ability on communication quantity was controlled for in the model. Because there was no relationship between language and communication quantity ( $\beta = .14$ ,  $p = .41$ ), there was no reason to include language ability in the model.

## Discussion

The analyses demonstrated support for Hypothesis 1 in terms of finding significantly lower trust in culturally diverse than in culturally homogenous ad hoc teams in a distributed setting. This finding was observed at both the individual and group levels of analysis.

In turn, trust was expected to mediate the effect of cultural diversity on team communication (quality and quantity) (Hypothesis 2). There was also found support for this second hypothesis: a significant relationship was found between trust and communication quality at the group level, in terms of high trust predicting a cooperative type of communication (i.e., communication quality). Moreover, the SEM analysis indicated that cultural diversity influenced communication quality mediated by trust. The hypothesized relationship between trust and the amount of communication (i.e., communication quantity), was found within the culturally diverse teams only. Although this finding was only significant at the individual level of analysis, the tendency was the same at the group level. Hypothesis 3, predicting that the communication (quality and quantity) influences outcomes positively, in terms of higher performance, was not found to be significant at either level of analysis.

## Implications and Future Research

The current results support research on trust in general, which has indicated that it is more difficult to build trust between people who are dissimilar than between people who are similar (e.g., Ibarra, 1993). Moreover, the results support the proposition set forth by McAllister (1995) of cultural similarity promoting trust. Being from the same culture may provide a positive effect of group bias and increase the interpretation and predictability of behavior. Mannix and Neale (2005) proposed the use of elements such as common goals, identity, and team culture to bring heterogeneous team members closer together. The current results rather suggest that a common goal, organizational culture (NATO military), and identity (military) are not enough to override national cultural differences, at least not in ad hoc distributed teams. Though a superordinate

<sup>4</sup> This included re-estimating the model excluding the Bulgarian and Swedish participants. This analysis resulted in only trivial changes in parameter estimates and  $p$ -values.

common identity may reduce group bias (e.g., Stone & Crisp, 2007), research by Laurent (1983) and Van der Zee et al. (2009) indicates that introducing a common identity may also backfire, i.e., if the common identity is perceived as a threat to the individuals' existing identity.

The presented results further suggest that trust may add interpretative value to team diversity research, providing a clarification as to how team heterogeneity affects team processes such as communication. Moreover, trust may explain the often mixed results from both demographic and competency types of diversity (e.g., Horwitz, 2005; Mannix & Neale, 2005). Indeed, unless trust is established in heterogeneous teams, the potential advantages contained in the collective capacity of the team (e.g., increased knowledge, viewpoints, and creativity) may not be realized. This also adds to Van Knippenberg et al.'s (2004) model; introducing trust explains the psychological processes by which group bias can affect group processes such as communication, as well as by which elaboration can be made difficult and likewise affect group processes.

Previously, several moderators have been suggested in team research (Bowers, Pharmer, & Salas, 2000; Horwitz, 2005; Mannix & Neale, 2005). However, trust has not been proposed as a moderator or as a mediator in this research. Based on the current results, it is suggested that trust be added as a mediator in future team composition research.

Based on the work of Jarvenpaa et al. (1998), and Serva et al. (2005), there is good reason to believe that the relationship between trust and team communication may be reciprocal in nature. Trust may form the basis for good communication, but good communication may also foster the building of trust. To eliminate the competing interpretation in the current research that communication may have caused the differences found in trust between the culturally heterogeneous and homogeneous teams, additional analyses at both the individual and group levels were performed.<sup>5</sup> The results showed that the significant difference found in trust between homogeneous and heterogeneous teams could not be accounted for by differences in communication. A proposition for future research, however, is to test for a feed-back loop from communication to trust by collecting time-series data.

The relationship found between trust and amount of communication in the culturally heterogeneous teams only, may indicate a double challenge; not only is there lower trust in ad hoc international teams than in national

teams, but the effect of lower trust may have greater consequences for collaborative-type behaviors such as communication in international teams. The question put forth by Jarvenpaa and Leidner (1999) as to whether technology might obliterate the negative effects of cultural diversity on communicative behaviors when in completely virtual settings was not supported in our research. The implication of the present results is that more attention must be paid to developing trust in international ad hoc teams than in national ad hoc teams. Prichard & Ashleigh (2007) and Jarvenpaa et al. (1998) demonstrated a positive effect on trust from team training, the latter research from global virtual teams. Face-to-face training, which is considered advantageous for building trust (e.g., Connaughton & Shuffler, 2007; Oertig & Buergi, 2006), was not found to be required in Jarvenpaa et al.'s research. Based on current and previous research (e.g., Ibarra, 1993; Webber, 2008), the logic seems to be that the more culturally diverse the team is at the outset, the more time and effort may be needed to build trust. Increasingly, both civilian and military organizations collaborate across borders, making this an important insight to consider to avoid the pitfalls and reap the benefits of cultural diversity in teams. If trust is not given the time and opportunity to be established in culturally diverse teams, the current results suggest negative effects on key team work processes such as communication. It is suggested that future research continue to examine how trust can best be built in international teams in general, as well as in internationally composed ad hoc teams in particular.

Contrary to expectations, the amount and quality of communication was not found to promote higher performance. Because the game was quite intense (1 h), it could be that using an extensive time on communication during the game also had some negative effects, such as less time to directly engage in point-collecting activities. This finding could arguably be an effect of a poorly chosen performance measure lacking in external validity. However, similar time conflicts between exchanging information through communication and acting is just as relevant in real life situations as in a game scenario. Although this latter point suggests a lack of a relationship between communication and performance, research has found performance to be a particularly difficult measure, because it is influenced by a wide range of confounding variables (e.g., Kozlowski & Ilgen, 2005). Consequently, Kozlowski and Ilgen suggested rather using key team processes such as communication as team outcome measures.

## Limitations and Methodological Issues

Results in this research were obtained with teams that differed in composition, in terms of being composed of

<sup>5</sup> A two-level hierarchical model showed that the difference between culturally homogenous teams and culturally heterogeneous teams in trust scores at the individual level was largely unaffected by controlling for differences in communication quantity.

either culturally homogeneous or culturally heterogeneous team members. Because all participants were military officers, the samples were well matched so that other sources of heterogeneity were largely controlled for. Nevertheless, any national differences in trust, any familiarity with team members, and other demographic heterogeneity indices were controlled for in an MLM analysis, showing no significant influences on trust. As indicated above, face-to-face collaboration is considered advantageous for building trust (e.g., Connaughton & Shuffler, 2007; Oertig & Buergi, 2006), suggesting that participants in the homogenous team situation seeing each other upon arrival (see the method section) could be interpreted as a confounder. However, previous research has studied face-to-face *collaboration* as a builder of trust, not mere exposure. Jarvenpaa et al. (1998) also found that trust could be built in a distributed collaborative situation with no face-to-face contact. In the present experiments, collaboration was completely anonymized, thus making mere exposure a less plausible explanation of the differences found in trust between the heterogeneous and homogeneous situations. Furthermore, any familiarity with other participants was controlled for, so any remaining effect would have to be related to mere exposure. The exposure-attraction research tradition (e.g., Zajonc, 1968) also rests on recognition. In the current research, this was not possible because collaboration was anonymized through the game interface. However, whether or how much influence a short, one-time exposure could have for the building of trust in distributed teams remains an empirical question that should be examined in future research.

Our analyses explored most of the relationships at both the individual and group levels. The results indicate good cross-level validity, which is consistent with what has been suggested in previous research (e.g., Serva et al., 2005). The relatively small sample size at the group level of analysis did, however, result in low power to detect statistically significant effects at this level.

Some may question whether using a computer-based game is the best way to study trust and collaborative behavior in teams. However, such games have previously been successfully employed in research on human behavior, though not in the same context as in this study (e.g., Aidman & Shmelyov, 2002; Devine, Martin, Bott, & Grayson, 2004). Additionally, because collaboration, and especially international collaboration, is increasingly computer-mediated and distributed, the current research method is growing in relevance.

The military sample in the current research makes the results primarily applicable to military and other operational-type organizations (e.g., medical, police, or crisis relief) – typically less researched environments than

the traditional business organization. However, the experimental setting in which this study was conducted (focusing on trust and communicational behaviors), was a context that could be transferrable also to distributed collaboration in for instance business contexts. This interpretation is corroborated by the fact that the present results largely support previous research conducted in such contexts.

## Conclusion

In line with expectations, there was observed lower trust in international than in national ad hoc distributed teams, which in turn was found to influence communication quality negatively. Low trust was found also to interact with team diversity, in terms of influencing communication quantity negatively. These findings suggest a double challenge; in international compared to national ad hoc distributed teams, trust may both become lower and have more consequences for some collaborative-type behaviors. Correspondingly, trust could be understood as a catalyst for communication in culturally diverse teams. No conclusions could be drawn pertaining to performance.

The implications of the current findings include that trust may add explanatory value as a mediator in future team composition research, that internationally composed distributed teams may be less than optimal if ad hoc organized, and that taking the time to build trust in such teams thus may be worthwhile. Suggestions for future team composition research include adding trust as a mediator and exploring how to best build trust in international distributed teams.

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### **Note from Editor.**

In the original publication of this manuscript table 1 was left out. This is an erratum published 15.06.2013 where the table is included as originally intended. All text and page numbers are in accordance with the original publication.

## **Appendix**

### **A.1 Organization Measures from Laboratory Studies**

#### **A.1.1 Structure (S), processes (P), and flexibility (F).**

- How would you describe the hierarchy in this team? (S)

Very hierarchic, somewhat hierarchic, no difference, somewhat flat, very flat.

- How would you describe the centralization/decentralization in this team? (P)

Very centralized, somewhat centralized, no difference, somewhat decentralized, very decentralized.

- How would you describe the flexibility in this team? (F)

Very rigid, somewhat rigid, no difference, somewhat flexible, very flexible.

### **A.2 Organization Measures from Field Studies**

#### **A.2.1 Structure (S), processes (P), flexibility (F), and organizational rating (OR).**

In the following questions we ask you to compare this exercise-organization with the organization you normally work in.

- How would you describe the level of hierarchy here? (S)

Much more hierarchic, a bit more hierarchic, no difference, a bit flatter, much flatter.

- How is the level of centralization/decentralization (self-organization) here? (P)

Much more centralized, a bit more centralized, no difference, a bit more decentralized, much more decentralized.

- How is the flexibility here? (F)

Much less flexible, a bit less flexible, no difference, a bit more flexible, much more flexible.

- How would you rate this organization compared to what you are used to? (OR)

Much poorer, somewhat poorer, no difference, somewhat better, much better.

### **A.2.2 Information sharing (IS), and decision making (DM).**

These questions pertain to this exercise:

- Do you feel like you get too much or too little information in order to make decisions? (IS1)

Too much, somewhat more than I need, appropriate amount, somewhat less than I need, and too little.

- How content are you with the information you receive? (IS2)

Very content, somewhat content, neutral, somewhat discontent, very discontent.

- In your opinion, are decisions made too slow, too fast, or just right in your environment?

(DM1)

Too slow, a bit slow, just right, a bit fast, too fast.

- In general, how would you rate decision quality in your environment? (DM2)

Very good, good, neutral, poor, very poor.

- How successful have decisions been in general in your environment? (i.e. outcome) (DM3)

Very successful, somewhat successful, neutral, somewhat unsuccessful, not at all successful.

### **A.3 Trust Measure**

- How confident were you that your team members would share important information with you?

Very confident, somewhat confident, neutral, somewhat doubtful, very doubtful.

- How confident were you that team members would assist you if you needed help?

Very confident, somewhat confident, neutral, somewhat doubtful, very doubtful.

- How confident were you that team members would fulfill their responsibilities?

Very confident, somewhat confident, neutral, somewhat doubtful, very doubtful.

#### **A.4 Values Survey Module 1994 (VSM – 94): Individualism/Collectivism (I/C) Measure**

As indicated at Hofstede's website, [www.geerthofstede.com](http://www.geerthofstede.com), the VSM-94 survey is allowed free use for research purposes.

Please think of an ideal job, disregarding your present job, if you have one. In choosing an ideal job, how important would it be to you to ...

- have sufficient time for your personal or family life?
- have good physical working conditions (good ventilation and lighting, adequate work space, etc.)?
- have security of employment?
- have an element of variety and adventure in the job?

Of utmost importance, very important, of moderate importance, of little importance, of very little or no importance.

